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Residual Neuromuscular Hypertension: Implication for Physiotherapy

Josephine L. Rathbone, Ph. D.

All manner of physical and psychological ills besetting the individual, as well as various dangers threatening society in general are blamed on "fatigue"; and authorities and teachers in every field of human endeavor are citing the nervous symptoms which accompany that "fatigue." It is fitting for thoughtful adults, and particularly those who are interested in health and physical education, to study the problems of fatigue in its early stages and the means of preventing as well as alleviating its consequences. Instructing children as well as adults in these matters constitutes one way to counteract the forces predisposing toward physical and psychological breakdown.

The study which is the basis of this series of articles for the "Physiotherapy Review" was undertaken in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Teachers College, Columbia University.* It aimed to clarify the terms used in the scientific discussions of "fatigue" in its various phases; to describe residual neuromuscular hypertension; to analyze, from the literature and from the cases which had been referred to a corrective physical education clinic, the underlying causes of fatigue and tension; and to point the way to procedures in educational practice which should reduce the incidence of excitability and nervousness in children and adults.

Part I

The Growing Interest in Fatigue as a Social and Medical Problem

People are no longer content just to be free from sickness; they now aspire to vigorous and abundant vitality. Furthermore, the concept of vitality or health has been expanded by physicians and psychiatrists, as well as psychologists and educators, to include mental and emotional as well as physical health. Two of the criteria for such health are that the individual shall pursue his affairs with calmness and poise, and that he shall suffer no fatigue from the day's work and play that reasonable overnight rest will not correct. The factors that lead to the full measure of health are many, and when an individual becomes ill, as evidenced by lack of calmness and by accumulated fatigue, the source of the error may be difficult to find. It may lie in handicaps with which the individual was born, in personal hygienic indiscretions, in disturbing emotional problems, or in thwarting limitations thrust upon the individual because of his environment.

In this section will be found a discussion of the outstanding contributions which have been made by sociologists, industrialists, physiologists, psychologists, psychiatrists, and other clinicians to the problems of fatigue and its reduction.

Sociologists. From the standpoint of the sociologists, at least, promoting the betterment of social conditions is the surest way to promote rest and contentment and to eliminate tension and fatigue. Poverty must be recognized, as well as ignorance, as a cause of physical and emotional breakdown; and overwork, with its resulting fatigue, must be given recognition, along with personal negligence, in the development of ill health.

In analyzing cases with residual neuromuscular hypertension, it becomes necessary to try to discover how much effect the current social upheaval may have had upon each one. Such an influence is doubtless a subtle one and operates remorselessly on everyone; but it is probably more acute on those who have been deprived of the satisfactions which come with economic security, and especially on those who have a consciousness of the evils of the situation and a real feeling of personal dissatisfaction and thwarting.

Industrialists. Since fatigue is the most characteristic of all attributes differentiating the human machine from the mechanical one, it has been a center of attack in industrial investigations. Champions of scientific management in industry for many years have contended that undue fatigue is the worst form of waste, and they have made an effort to eliminate all unnecessary fatigue.[1] The principle is simple. A man will be happier if he is more comfortable; and he will turn out more work at less cost if his conditions of comfort and health are favorable.

Of course the study of such a complicated subject as man's reaction to work has raised many questions. Are not the causes of fatigue partly within the individual as well as within his work conditions? Is the chronic fatigue which threatens the modern working man the result of excessive toil alone, or of such factors as fear, worry, and other emotional tensions? Furthermore, al-

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though moderate toil at a slow rhythm may not be seriously exhausting, will not most modern industrial work with its high specialization, high rate of speed, and environment of intense noise and glare have most serious consequences for mind and body? Does not adjusting oneself to the constant vibration of machines in industrial plants involve an increased intensity of effort that is most favorable for the approach of neuromuscular hypertension and, finally, exhaustion? Does not fatigue diminish output not only directly, but indirectly, by causing sickness and absence of employees, and by increasing spoiled work and accidents?

The correlations between output and fatigue are often confusing, and all industrial studies of fatigue in relation to output have not proved convincing to those who have never stopped to consider the relationship of the different stages of fatigue—hypertension and exhaustion—to energy. For instances, some studies show that fatigue in minor doses increases speed, accuracy, and alertness. These findings are easy to explain. If one will recall that in the early stages of fatigue there are always to be found certain degrees of hyperexcitability, one will realize why the immediate effects of fatigue are often to speed up production and increase output. Furthermore, fatigue will always be a counterpart more of striving than of systematic doing. "It is not the man who is least tired who accomplishes most; it is the most able individual who may be driving himself toward exhaustion."[2] It is, therefore, necessary to measure fatigue costs in relation to the long term effects—health, longevity, labor supply, employment stability, industrial contentment, as well as efficiency.

Under experimental conditions it has been shown that alleviation of monotony, increase in wages, reduction of working hours, and otherwise scientifically controlled working conditions reduce fatigue, improve morale, and increase output. It has seemed feasible in industry, in some instances, to vary the worker's jobs from time to time in order to break the monotony. Some managers have found it a good plan to have short rest periods regularly throughout the day, since such periods offer one a means of averting the consequences of industrial fatigue and are economically desirable.[3]

Since the subjects for the study here reported came primarily from the professional classes, certain problems mentioned in the foregoing paragraphs could not be investigated thoroughly. They suggest certain approaches, however, which were found valuable in an analysis of hypertension and fatigue in the mental as well as the manual worker.

Physiologists. As is well known, when it was discovered that fatigue curves constructed directly from output records were inadequate measures of the fatigue involved, investigations of fatigue in industry and the measuring of energy costs of human work led into the physiology laboratory. Since metabolism, upon which life depends, is the fundamental basis for an explanation of what fatigue really is, the chemical and physiologic nature of fatigue had to be taken into serious consideration.

Part II in this series of articles will be given over to a fuller discussion of the physiologic explanations of fatigue, but some mention of the general principles must be made at this point. "Fatigue may normally be considered a condition of lowered capacity for work, resulting directly from the accumulation of the products of activity and varying with the duration, rate, and intensity of the performance, and the initial strength of the capacity of the physical system involved."[4] It is not the work that has gone before but the work that can still be done that determines the degree of fatigue.

Laboratory experiments have demonstrated that fatigue in the neuromuscular system takes place at three centers: first, in the muscle tissues where stored glycogen is used up and fatigue products are liberated; second, in the end plates of the nerves in the muscles and the synapses between different neurones, as demonstrated by Sherrington. These synapses are affected by fatigue products in the circulation and are considered the essential seat of fatigue by many experimenters. Third, some observers have stated that the nucleus of the nerve cell shrinks with the performance of work.

From the standpoint of this study it was extremely important to discover how the cases under analysis had been affected by their initial strength or capacity, by the reduction in the energy stores and the accumulation of waste products of activity, and by the drain upon their nervous systems.

Psychologists. Psychologists have turned their attention to the study of so-called "mental fatigue" and have had difficulty in coming to an agreement as to its exact nature. In the first place, they have tried to analyze the physiologic processes involved. Since physical fatigue is caused partly by the accumulation of waste products of metabolic activity in living substance, and partly by exhaustion of the material that had been stored up by the living substance for the manifestation or maintenance of its special function, they have sought to find sufficient metabolic causes in the nervous tissue for lessened functional mental activity.

Having accepted from the physiologists the concepts that the essential seat of fatigue is the synapses and that normal fatigue is due primarily to processes going on within the nervous system, they have studied the physiologic changes in central fatigue. But they have found these physiologic and neurologic changes incommensurate with the discomfort and reduction in mental efficiency with continued intellectual work. So they have turned to an analysis of the muscular accompaniments of mental work, since ordinary mental work involves the activity of muscles as well as neurones of the central nervous system. The muscular effects of mental work are comparatively slight, however, and the physical changes which can be noted by metabolic tests do not account for the fact that mental work over long periods of time causes such marked reactions in people and such marked lowering of the curve of output.

Many psychologists wish to interpret the term "mental fatigue." Thorndike acknowledges the extremely slight "mechanical" and "physiological" mental fatigue caused by the end products of the muscular work involved, but states that, in the popular sense, "fatigue" means that we are less willing rather than less able to act.[5] The factor, says Thorndike, that determines the "feelings of fatigue" associated with mental work is interest or satisfyingness. As interest wanes, monotony enters. A favorable attitude thus goes with a favorable effect. As long as interest is present, the attitude of attention readily continues unaltered, and the subject does not complain of fatigue.

Although Thorndike acknowledges the bio-neurogenic phases of mental fatigue, he places his greatest emphasis upon its psychogenic aspects. The fact upon which he appears to have placed insufficient emphasis is that subjective impressions of discomfort from mental work may actually indicate deep-seated physiologic changes.[6] Accompanying the sense of fatigue, or "the mental observation that the work is no longer progressing satis-

factorily,"[7] are local sensations in the joints, tendon sheaths, and muscles which are due to the overwork demanded of these tissues during mental work. It appears that these latter sensations should be analyzed as indices of the degree of true fatigue accompanying mental work.

The generalized feelings of fatigue which accompany ennui, because of their subjective character, cannot be measured with any degree of accuracy. The more specific local sensations, however, can be more accurately observed in normal individuals. These observations may help to explain changes in the neuromuscular system which can be referred to mental activity preceding or accompanying them and may help to solve perplexing problems of "mental fatigue," particularly the factor of feelings of fatigue.

The author hopes that the study reported in these articles will throw some light on the topic. So many of the cases which have been analyzed have come from the teaching field, and so much of their work has been "mental," that it has been necessary to put particular attention upon this aspect of the subject of general fatigue.

Psychiatrists. There is no question but that emotional factors enter into all forms of fatigue. Just as mental fatigue is influenced by satisfyingness, so normal or chronic physiologic fatigue is augmented or reduced by emotional factors. Although Freud himself has subscribed to a hormonal or chemical theory of neurasthenia, psychiatrists in general have explained the psychophysical syndrome called neurasthenia as a form of neurosis rather than as a sign of physical exhaustion. Even the usual complaints of the neurasthenic, such as pains in the head, neck, back and hips, the empty or heavy feeling in the stomach, the aversion to light and noises, and the difficulty in concentrating may all be explained, they claim, on the supposition of emotional stress in which the individual singles out by attention the physical symptoms and gains satisfaction in unloading responsibility for his distress on those symptoms. According to this school of psychiatry, the effective conflict which is at the bottom of all these disturbances and which has to be dealt with is difficult to uncover because the patient seeks to dissimulate. He prefers to be the victim of a disease to admitting that basic conflict.[8]

As is well known, many individuals with neurasthenic tendencies are afraid of fatigue, have an obsession of fatigue. Among any group of individuals complaining of fatigue will be found some who are emotionally concerned about fatigue. They may be afraid of fatigue because they have not learned that normal fatigue is good and accompanies normal work. Or they may have experienced, at some time, distressing consequences of overwork and fear a recurrence of those symptoms. Or they may have a lowered sensory threshold to fatigue. One must not dismiss these cases too hastily, and one must be wary to analyze all the aspects of fatigue, psychogenic as well as bioneurogenic.

Clinicians. For many years, physicians have been trying to reduce fatigue and the attendant neuromuscular hypertension in their patients. Beard, who first named neurasthenia, was a physician of good repute. Following him, almost immediately, we had in this country two clinicians who developed definite systems for combating the evil: S. Weir Mitchell[9], a physician well loved and esteemed by many; and Annie Payson Call,[10] a teacher whose writings have been widely read. Mitchell advocated entire rest in bed and excessive feeding, passive exercise through massage, and heat by means of electrotherapy. Call emphasized that there is no benefit from taking medicine to give new strength when at the same time one is disobeying the very laws from the observance of which strength can come. She advocated the avoidance of nature's punishments by obedience to the laws of healthful living. Furthermore, she was the first to suggest that one must become conscious of useless contractions and relax the muscles "in spite of themselves."[11]

Many other physicians since the time of Mitchell and Call have sought physical relaxation and psychologic repose for their patients, but the one best known at present is Jacobson.[12] He has spent years in his physiology laboratory and in his medical office studying this subject exclusively. He says that neuromuscular tension in any part of the body tends to enhance excitability, excess activity, and nervousness. He has worked out a method for the voluntary reduction of muscular contractions, a method which can be cultivated as any habit and which will lower emotivity and promote normal physiologic functioning. He emphasizes the fact that only by doing away with residual tension can relaxation for therapeutic purposes can be accomplished. As a preventive of neuromuscular hypertension, he advocates the using of a minimum of tension of the muscles required for an act and the relaxing of the others so that a maximum of achievement may result with a minimum of energy output.

Some physicians have sought diets which would offset and counteract fatigue. They have fed their patients food stuffs which were strong in energy building properties, especially carbohydrates. They have advocated the feeding of maltose, because it is one of the sugars to leave the stomach most quickly and so to be changed into glycogen to be carried into the blood stream for the muscles which need it for fuel.

Diet specialists have considered also the desirability of counteracting the acid formation in physical work by feeding foods high in alkaline reacting qualities. The buffering effect of the blood is so efficient, however, that grave doubt exists as to the possible effects of either acid or alkaline reacting foods on the general state of the body.

Because calcium metabolism appears to play an important role in neuromuscular hypertension and its release, other physicians are beginning to give calcium medication in many forms. Since ultra violet irradiation influences the assimilation of calcium, sun and artificial helio-therapy have been instituted for states of nervous irritability.

When pathologic variations of the muscle tonus occur, the amount of the creatinic substances in the blood and urine vary to the same extent as the tonus. In some spastic syndromes and convulsions, it appears that there is a parallelism between hypertonus and hypercreatinemia.[13] The study of the relationship between creatin and muscle tonus is in its infancy but it promises to reveal valuable information.

Since the temperature of the muscles and the condition of the circulation of blood and lymph through them determine, in part, their reaction to the accumulation of fatigue products, physical therapy in the forms of massage and applications of heat has been used with considerable relief for the patient. Gentle massage of the superficial nerve endings and heat applied to the muscle tissue counteract pain sensations and so reduce one of the important causes for continued tension.

Religious Teachers. Before leaving the subject of clinical treatments for neuromuscular hypertension and fatigue, it is necessary to note that many religious and semi-religious cults have had their share in alleviating the ills of man by helping the individual to gain composure and strength by trusting in a divine or superhuman power which will assume his burdens and relieve him of many of his cares and worries.

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(Editor's Note: This is the first of a series of articles by Miss Rathbone. The next will appear in an early issue.)

Backache Due to Functional Decompensation

Emil Hauser, M. D.

Backaches may be classified on an etiological basis as (1) those due to inflammation; (2) those due to tumors or new growths; (3) those due to trauma; and (4) those due to congenital anomalies. In a fifth group the pain is referred to the back from an organic lesion elsewhere. The anatomical changes may involve the bones, the ligaments, the muscles, the spinal cord or the nerves. It is apparent, therefore, that innumerable types of lesions may be presented. However, each type will give findings that, with proper examination, will permit a definite diagnosis. In addition to these five groups there is a very large group in which the actual disturbance which causes the pain and concomitant symptoms producing a symptom complex is not due to an organic lesion. This symptom complex has been designated as backache due to functional decompensation.

The first symptom of a functional decompensation of the back is a feeling of "tiredness" in the back. In addition to the fatigue in the back, patients complain of a generalized fatigue. Of primary importance, however, is the pain in the back which may be of two types. The patient first notes a generalized "ache" with an associated stiffness on arising after rest, and often states that the back feels "sore." Later, a localized pain develops in the region of the lumbosacral angle or over the sacroiliac joint; this pain is severe and persistent; frequently it occurs after some acute strain such as bending over to lift. At times it is associated with a so-called "catch" which is a sharp pain that prevents the individual from straightening his back. This pain may last from several hours to several days. In addition there is a secondary pain which is referred along the lower extremities; many times it follows the distribution of the sciatic nerve; at other times it follows the course of the musculocutaneous or inguinal nerves; often it involves first one and then the other, and at times we find associated paresthesias.

The principal objective finding is an increase of all the normal curvatures of the back—a rounded dorsal hyphosis and increased lumbar lordosis with an associated increase of the lumbosacral angle and, in severe cases, an appreciable right dorsal scoliosis. The muscle tone is usually impaired; the abdominal muscles are weak and there is a tendency toward a pendulous abdomen. During the acute stage—that is, with the severe localized lumbosacral or sacroiliac pain, there is a loss of the lumbosacral curve due to marked muscular spasm in this region. If one sacroiliac is involved, a protective list is common. If the referred pain in the lower extremity has been of long standing there may be a limited amount of atrophy in the quadriceps muscle. Pressure over the lumbosacral angle and sacroiliac area may or may not elicit definite tenderness, depending upon the acuteness of the condition. The X-ray findings are essentially negative. The lumbosacral angle will be increased as a result of the increased lumbosacral curve. The fifth lumbar is subject to many congenital anomalies; if these are extreme they may play a role in this symptom complex. If the condition is of long standing, secondary changes occur; these consist of loss of joint space between the fifth lumbar and the sacrum, and of overgrowth, giving a hypertrophic type of arthritis in the lumbar area or of the sacroiliac synchondrosis. Usually the basal metabolic rate is below normal; the blood pressure is sub-normal, and the hemoglobin is low.

The etiology of this condition may be covered by a bold statement; the symptom complex can be diagnosed as a fatigue syndrome; in other words, there is an imbalance between the capacity of the back to do its normal work, and the work demanded of the back. This imbalance may be due either to a decrease in the ca-

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pacity of the back, an increase in the load, or to a combination of the two. The decrease in capacity results from conditions that decrease the strength of the structures, namely the bones, the ligaments and the muscles. The variations in the etiological factors that bring about such weakness are legion. Some of the more frequent causes seen in a review of 300 cases were (1) structural weakness following adolescence; (2) weakness due to strain; and (3) weakness following repeated ligamentous tears. Better to understand what is meant by an increased load we must remember that the primary function of the back is to hold the upright position; in other words, prolonged sitting or standing will cause an overstrain of the structures of the back. When the muscles become fatigued strain is thrown upon the ligaments and joints. Continued strain of these structures will result in inflammation. Inflammatory reaction, if acute, will automatically set up muscle spasm. The acute attack that occurs following sudden lifting or twisting is explained on the basis of a ligamentous tear in the same way that a sprained ankle occurs in a weak foot. The pains referred down the extremities are radiating pains along the course of the peripheral nerves, due to a reflex mechanism. Repeated irritations set up by an inflammation in the sacroiliac and lumbosacral joints, as well as the overstrained lumbar muscles, give rise to a stimulus which ultimately oversteps the threshold of normal reaction.[1] In addition to these repeated stimuli there is sometimes a hypersensitivity of the nerve itself due to nervous fatigue. Relief of the irritation will give relief of the neuralgia.

The diagnosis is based on the absence of an organic lesion. In the presence of a low back pain in the lumbosacral and sacroiliac areas, poor posture, impaired muscle tone, and the symptoms of fatigue are important in establishing the diagnosis. Significant is the relief of symptoms obtained by strapping of the lumbosacral area with adhesive, with the patient holding himself as tall as possible.

If allowed to remain untreated the condition gradually becomes progressively worse. Relief of the acute phase is obtained by rest, but prolonged rest decreases strength and so the individual is more subject to a recurrence. Gradually the attacks become more frequent and more severe, until ultimately the pain in the back becomes continuous. With proper treatment the prognosis is very good. Relief of the functional decompensation will invariably give relief of the symptom complex.

Summary

A new symptom complex called functional decompensation of the back is described as the most frequent cause of low back pain. It is characterized by an absence of a primary lesion. The first symptom is a "tiredness" in the back associated with general fatigue. Pain is the most important complaint and is of two types —the one, a soreness and stiffness in the muscles; the other, sharp and localized at the lumbosacral angle and the sacroiliac synchondrosis. Clinical findings are an increase of all the normal curvatures of the back; sacroiliac and lumbrosacral tenderness; and impaired muscle tone. Sciatica is a common complication. The condition is due to an imbalance between the functional capacity of the back and the demands made upon it. Reestablishment of normal balance gives relief. Increase of reserve capacity to compensate for all demands made upon the back results in a cure.

These conclusions are based on the study of over 300 cases over a period of ten years.

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Exercises for Backache Due to Functional Decompensation

Emil Hauser, M. D., and Mildred Elson*

The treatment for backaches due to functional decompensation consists: (1) in relieving the inflammation through the use of rest, heat, massage and by proper adhesive strapping; (2) reestablishment of normal posture by means of a corrective or active plaster of Paris cast; and (3) reestablishment of normal strength and the increase of reserve capacity to compensate for all demands made upon the back. To improve muscular capacity means, first of all, sufficient rest to guard against strain. This is carried out by short periods of rest of ten to twenty minutes at definite intervals which vary from one-half hour to four hours. With adequate periods of rest, exercises can be carried out to an advantage.

It is important that these exercises be in accord with the normal function of the back which is to hold the erect posture. Other functions are relatively secondary. Therefore, it is important that functional exercises be thoroughly understood. It is not necessary to use the exact exercises prescribed, inasmuch as it is found that certain alterations are made for the individual. However, it is of value to have some standard exercises to use as a basis for the correction or for the reestablishment of normal capacity.

The first function, as already stated, is holding the correct posture. Much has been written on this subject, but experience has proved that words are inadequate to teach correct posture. The best posture has been observed in people who balance and carry baskets and jugs on their heads, as, for instance, the Balinese. The reason for this is that in order to balance an extra load upon the head it is necessary to have accurate muscle control as well as normal or superior strength in the muscles that control the body. This conception has been carried over into practical treatment. A sandbag six inches square and two inches thick is balanced

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upon the head. If the bag is firm, the difficulty in balancing is increased, so that for the beginner the bag is loosely filled. A practical idea has been to substitute bird gravel for sand because it is cleaner and more easily obtained. The weight of the bag should be about four pounds. The correct posture with the sandbag will be obtained when the patient stands as tall as possible and balances the sandbag on the head in such a way that the weight can be felt throughout the entire back. The patient who does this then has the feeling of what his position should be. No further instructions are required. Once this correct posture, or the holding of this position has been experienced, the individual knows what to strive for.

To further increase the strength of the muscles of the abdomen and the back, a series of exercises is utilized.

Exercise 1. The patient stands erect and draws himself up as tall as he can. With the cast applied it is possible to pull up the abdomen and correct the rounded dorsal kyphosis against the margin of the cast. The chest is expanded, the costal angle increased, and as much air is inspired as possible. In this way the vital capacity is increased. This exercise can be carried out repeatedly during the day. It is done while sitting or standing, or while riding in a car.

Exercise 2. This is the same as the first exercise with the addition of full extension of the arms which are raised overhead laterally. Emphasis is placed upon the stretching and tension of the muscles as well as the accuracy with which the movements are accomplished. This means the same rhythm is carried out with both arms during extension and return. The fingers are held in the same position throughout the entire exercise. The position of the body must be the same after the exercise is accomplished as at the beginning. Inspiration is carried out before the exercise is started and expiration is not permitted until the exercise is complete. This is repeated by raising the arms overhead anteriorly in the same manner.

Exercise 3. The hands are placed upon the hips or upon the cast. With full inspiration and full extension the patient bends to one side and then to the other side, resting between each movement. In the same way, the patient bends backward against the cast, and with hyperextension of the body the patient bends forward, all motion being accomplished at the hip joints.

Exercise 4. The purpose of this exercise is to increase the poise and power of balancing the body. The fundamental erect position with inhalation is taken and one leg with the knee straight is raised, at the same time holding an accurate balance. Expiration is permitted between each movement. Each foot is brought up in every direction—front, back and side.

This is the first series of exercises. The number of times each exercise is executed is dependent upon the capacity of the individual. No stress is placed upon the number of times each exercise can be carried out consecutively. The important thing is the accuracy with which each exercise is executed. It is sufficient to do each exercise a single time providing the utmost exertion is applied to accomplish perfection. The number of times the series is repeated is dependent upon the number of periodic rests it is possible for the individual to have. This can be as many as eight to ten, or it may be limited to one or two a day. Rather than increase the number of times each exercise is executed, it is better to add a different type of exercise.

Series II. The second series is carried out in the supine position. The patient lies on his back and slowly raises both legs with the knees stiff, and then lowers them at the same rate. With the arms folded and the legs flat, the patient next sits up, holding the erect position as he goes up as well as when he goes down. These movements are carried out with a slow, rhythmic motion.

Series III. The third group of exercises consists of what is ordinarily called the push-up, and chinning oneself. In the push-up, the body is prone, the weight being supported on the extended arms and upon the toes; the back is held straight and the pelvis is up; the elbows are then flexed, allowing the chest to approach the table without touching, and the body weight is pushed up by extending the elbows. Most patients are unable to do this at first, but after a few weeks they can carry out the exercise and can gradually increase the number of times it is done. The chinning exercise is carried out at home. A horizontal bar is fastened into a doorway. These can be purchased at a sporting goods house. In order to bring the head above the bar by means of flexion of the elbows it is necessary to contract the abdominal and back muscles. At the same time the forearm, arm and shoulders are developed.

The most important exercise is learning the normal gait. Practically all of these patients who have a muscular insufficiency of the back walk with some degree of shuffling gait. This means that they let the body sag and shift the body weight from one foot to the other. The correct gait consists primarily in holding the body erect with the trunk muscles, and a propelling motion is carried out with the feet. This means a rolling gait in which the heel strikes first and the motion is carried on the outside of the foot over onto the great toe. A rolling gait with spring in the motion is accomplished by doing this exercise. It is impossible to walk in this manner without holding the body erect. Swimming is permitted very early inasmuch as it requires no strain and is an exercise which can develop strength rapidly, so that swimming is encouraged long before they are permitted to walk as much as they please.

With the reestablishment of normal gait, we have the patient carrying out a primary functional exercise. It is the province of the exercises just described to increase the capacity so that the normal exercises can be accomplished without strain. The objective in every case is to permit the individual to carry out the work that is normally required of him. As soon as it is possible to build up enough capacity to enable return to normal occupation, the chief function of graduated exercises has been accomplished.

The normal exercises vary in all walks of life. The farmer is permitted to continue his work in the fields; the office manager who prefers to get his exercise on the golf course is encouraged to continue his golf regularly; and the woman who wishes to play tennis may do so.

With the return to normal physiological exercises there is a reestablishment of normal balance between the capacity of the back and the demands made upon it. The result will be removal of decompensation and relief of the symptoms.

The exercises, however, are continued until there is sufficient reserve capacity so that any increased demand will not set up an immediate recurrence. When the reserve capacity has been reestablished we can speak of cure.

The Treatment of Infections of the Genital Tract of Women by Means of the Elliott Vaginal Heat Regulator

Lawrence M. Randall, M. D.,* and Frank H. Krusen, M. D.**

Applications of heat have been in use for the treatment of infections for an unknown length of time. To increase the temperature of the affected part of the body increases the flow of blood to that part, bringing about an increase of the cellular elements of the blood that combat infection. The more nearly completely the heat can be applied to the parts to be treated the more satisfactory will be the results insofar as heat is able to accomplish the resolution of the infection. Consequently this form of treatment has come to play an important rôle in the treatment of infections of the genital tract of women. These infections are present in a large number of the cases encountered in gynecologic practice. It is the consensus that every effort should be made first to treat these infections by conservative means, particularly if the patients are young. Surgical treatment may be necessary to drain collections of pus in the stage of acute infection but to employ surgical treatment in the average acute or subacute case will mean removal of tissue that probably could be saved by conservative treatment. In the chronic case, or if the individual has suffered numerous exacerbations of the infection, the need of surgical treatment will be more frequent and the percentage of patients who will respond satisfactorily to conservative treatment will decrease in proportion. It has been shown that of the total number of patients of all ages who have inflammatory disease of the genital tract, 25 percent are eventually treated by surgical measures. It is our feeling that the proper application of conservative treatment in the acute and subacute stages of the condition can greatly reduce this 25 percent.

The proper application of conservative treatment of these infections imposes certain responsibilities on both patient and physician. The patient must realize that to combat and cure the infection without surgical treatment demands time and rest in order that the normal reaction of the body to the infection may accomplish the maximal effect. One is attempting to conserve tissue that has a definite function and that, once removed or destroyed, cannot be replaced. The physician must keep in mind that the first rule in the treatment of these conditions is to conserve and augment the body's natural defense mechanism against infection. In the acute stage of an infection this is done by means of absolute rest in bed in a Fowler position, together with sufficient sedative to keep the patient comfortable. The measures usually employed to improve the general condition of the patient should be employed as indicated in the given case. When the element of peritonitis is dominant, intake of all food and fluid by mouth should be stopped in order that the intestinal action will not stir up and disseminate the infection throughout the peritoneal cavity. When the process is localized, the gastro-intestinal tract can be allowed to function again. It is during this stage of the infection that the condition is localized and nothing should be done to interfere with this process. When the initial reaction is over, local treatment may be commenced. The aim of treatment is to aid the natural bodily defense. One of these aids consists in the application of heat to the pelvic viscera. As stated before, heat is of value in increasing the flow of blood to the pelvis, thus increasing the local leukocytosis. There are several means of applying heat to the female pelvis; one very satisfactory method is by means of the Elliott vaginal heat regulator. By this device heat is applied through the medium of hot water circulating in the distensible rubber bag that is inserted into the vagina.

It is a cardinal principle of this form of therapy that the vaginal canal must be distended to capacity in order to obtain the maximal effect of heat. Failure to secure this distention is probably the most common error made in this form of treatment. It is preferable to distend the bag with water of a temperature from 105° to 110° F. in order that the higher temperatures ordinarily used for a treatment do not cause so much initial discomfort that sufficient distention cannot be obtained. When the vagina is distended to capacity after the well lubricated bag has been properly inserted and uniformly expanded, the temperature of the circulating water is increased as much as the patient can tolerate. The maximal temperature used is said to be 130° F. but it will be found, when sufficient distention is employed, the average temperature will be in the neighborhood of 125° F. and that many patients will tolerate less than that amount. After insertion has been made and distention secured, it is preferable to palpate the distended applicator in order to be certain that the bag lies in a transverse position in the vagina and that it is not pulled downward toward the vaginal introitus by the weight of the rubber tube which connects the bag to the machine. It is probably true that no Elliott treatment should be entirely comfortable to the patient. If the patient notes no sense of fullness or pressure it is well to investigate by palpation the distention of the bag. The pressure recorded on the dial of the machine will average about 2 pounds. However, the patient's sense of pressure, together with palpation of the bag, is a more reliable index to sufficient pressure than the reading on the pressure gauge of the machine. Treatment is usually given for from one to three hours daily.

The proper selection of patients for this method of treatment is of importance. As indicated above, the patient who has an acute process as a rule should not be disturbed by any method of treatment that involves manipulation of the vagina or cervix. There are exceptions to this rule in certain instances of postpartum or postabortal infection, in which the whole genital tract is involved. One of the chief dangers of local treatment

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in acute infections is that of causing upward extension of the infection. Further, at the time of the initial infection there occur leukocytosis and local reaction. It is doubtful, in the usual case, that any benefit that may accrue from treatment will counterbalance the danger of interference with this defense. When the initial reaction is over it becomes desirable further to stimulate the blood flow and so the local leukocytosis. The size and distensibility of the vagina should in part determine whether the patient is a suitable candidate for this form of treatment. If the patient is a nulliparous woman it is frequently impossible to insert or distend the bag sufficiently. If there is fixation of the broad ligaments, with tenderness and fixation of the vaginal fornices, the same may be true. If women have passed the menopause there may be considerable reduction in the size of the vagina. Further, the mucous membrane of these patients is atrophic, has a reduced blood supply, and is less able to endure heat. In some cases marked vaginitis is present, or other local conditions such as edema and ecchymosis following childbirth, which add to the risk of damage to the vaginal mucous membrane.

The situation of an infected adnexal mass may influence one in deciding on the proper method of applying heat. A high-lying tubo-ovarian mass may not be sufficiently close to the vagina to permit dissemination of heat through the intervening distance; again, the extent of induration of the broad ligament may be such that sufficient distention cannot be secured to expand the applicator properly.

The bacteriologic cause of the infection has not a great deal to do with the selection of local application of heat as a method of treatment. The common organisms invading the pelvis of the human female are the streptococcus and the gonococcus, and hyperemia and increased local leukocytosis are of benefit in the presence of either.

It is now recognized that artificial fever therapy, administered with the patient in a cabinet, by which the general body temperature is raised, offers the most effective method of treatment for gonorrheal infection. Pelvic infection attributable to other organisms has not responded to this form of therapy in a manner sufficient to justify its use. Reports have been made that a combination of artificial fever therapy and vaginal applications of heat is more efficacious in the treatment of gonorrheal infection than either one alone. In applying the combination treatment, the patient is first placed in the cabinet and the temperature is elevated to that which is to be maintained at the time the Elliott bag is inserted, distention is obtained and a temperature of 120° and 122° F. is maintained in the applicator. The vaginal applicator is allowed to remain for two or three hours and then is removed.

It should be remembered that patients who have systemic fever of 105° to 107° F. cannot disseminate the heat from the local applicator so readily. Hence, the maximal temperature in the applicator should be not 130° F., as in other cases, but 122° F. when combined fever and Elliott treatments are employed.

As has been noted above, one may encounter a case of extensive pelvic cellulitis or salpingo-oophoritis in which sufficient distention of the vagina cannot be secured for effective treatment with the vaginal applicator. A rectal applicator is now in use that measures 5.5 by 9 cm. when empty. This bag can be distended to fill the lumen of the rectum completely. The applicator folded on its long axis and grasped about 3 cm. fr the distal end by a smooth curved forceps. The tip the bag and the anal orifice are lubricated. The bag then introduced through the sphincter, the forceps re moved and the insertion completed with the finger. T base of the bag must be well above the dentate marg If this precaution is not taken there will occur a desire expel the bag which will lead to unsatisfactory trea ment. Sufficient pressure is employed to give the pa tient a definite sense of fullness in the rectum. T temperature is maintained between 122° to 125° F. T rectum should be cleansed of fecal matter before inser ing the bag. The anal and rectal mucosa should be i spected through a proctoscope before treatment is co menced. Further observation is desirable from time time in the course of treatment. We have not se significant evidence of damage to the mucosa in ca in which this treatment is employed.

We have not employed the rectal method of tre ment in cases of active gonorrheal infection unless gono rheal proctitis could be demonstrated.

When one comes to consideration of the results treatment of infections of the genital tract of wome many factors must be considered. It is perhaps unfa or unsound to consider the results of treatment sole on the basis of a method of applying heat. Much d pends on the program that is followed in the gener management of the patient who has such an infectio As has been indicated above the best method of manag ment in the acute stage is based on absolute rest, wi little, if any, attempt at local treatment. This is fr quently not carried out in the most efficient manne The lack of efficiency may be attributable, in some in stances, to lack of appreciation by the physician of th necessity for such measures; it may often be attributab to lack of cooperation by the patient, and last, but n least, it may be attributable to difficulties arising fro the economic or social status of the patient. It is n doubt true that ultimate success in producing a satisfac tory result is based, to a great extent, on the method o management that has been used in the initial period o the infection. It is generally recognized that adequat management and treatment of the initial attack of pelvi inflammatory disease, regardless of etiology, is produc tive of better results than the same management an treatment when applied to an individual who has a long history of infection with repeated exacerbations. In the latter case one is dealing not only with infection but wit the results of infection, such as adhesions, interference with the blood supply and destruction of tissue caused by the long-standing inflammatory process. To disre gard the other fundamental principles of treatment is to put the Elliott treatment, or any other method of ap plying heat, in an unfavorable light. This form o therapy is simply a means that should be woven int the general scheme of management and not one that should be held responsible for all the good or bad re sults that may accrue from an attempt to treat these con ditions by conservative means. If this form of therapy is employed on this basis it will materially aid in obtain ing good results. We regard it as a valuable means o applying heat to the pelvic viscera. Properly employed it will produce those results which can be expected from heat.

Some Psychiatric Implications of Massage*

Edward G. Billings, M. D.,** and Marguerite E. Collins***

Massage (from the Greek "massein"—"to knead") is the physical therapy which has to do with scientific manipulation of the soft tissues of the body for the purpose of ameliorating or alleviating ill health. The basic principle, historically as old as man, is *rubbing*. Rubbing was first described as a therapeutic procedure by the Chinese as early as 3000 B.C. Massage, however, was not placed on a scientific basis until Henrik Ling (Sweden) organized the data of gymnastics and massage in 1813, and Mezger (1860), of Amsterdam and later of Weisbaden, established the art of massage as a therapy.

Since then many notable physicians and technicians have published widely on the subject of technique and indications. Much of the investigative and therapeutic work has dealt with the more medical and orthopedic problems and has shown the value of massage to be great. Massage, nevertheless, is still one of the most abused and little used therapies in general medicine, except in the larger hospital and training centers. This is especially true of its incorporation in the treatment of the psychiatric patient, as indicated by the scarcity of comments in the English literature pertaining particularly to the dangers and contra-indications of this procedure in the treatment of the more personality determined illnesses. This does not imply that massage is not an efficacious method of therapy in psychiatric disorders. The numerous works dealing with the value of this therapy and the wide application of it to such clinical problems indicate its remedial importance. However, during the past two decades, enough has been learned about personality function to make clear that there are too many dangers connected with massage to subject the patient to the therapy as a mere routine.

It is with this in mind that the memoranda and suggestions to follow are made.

Massage, in the narrow sense, is purely a mechanical procedure directly affecting the skin, fascia, muscles, the peripheral portion of the nervous system, and the peripheral vascular and lymph apparati. In a more broad sense, however, it is a therapeutic method that involves thermal (local and occasionally even general), biochemical (local tissue, general metabolic and hormonal) and always psychobiological functions. The last mentioned influence is, as a rule, nearly negligible; but, in the case of the patient whose personality functions are involved as a result of his sickness, whatever the cause and nature of it may be, any maneuver which may further affect the psychobiological functioning is dangerous to the patient unless intelligently and carefully applied.

The psychiatrically sick patient frequently not only is more sensitive to stimuli applied to the surface of his body, but may be subject to the incorporation of those stimuli and sensations with his memories, anticipations, worries, fears, fancies, delusions and hallucinations. Such a patient may develop certain aversions to procedures because they are misunderstood, misinterpreted or colored as a result of his personal feelings, ideas, and so forth. It must also be remembered that his automatic regulators, the affective functions, vegetative nervous system, temperature regulating functions and hormonal activities, are closely integrated with his personality performances and may show evidence of profound reaction when these performances are involved and modified by any maneuver, therapeutic or otherwise. Thus, following a massage instituted to aid relaxation and to promote ease and better sleep, a patient may react instead with restlessness, tension, increase in pulse rate, a rise in temperature, increase in blood sugar, frequency in urination, nausea, vomiting, even fear, and hatred or a sensual attachment for the therapist. This may occur without the patient's realizing why he feels or behaves so. He is aware only that he is more ill as a result of a measure prescribed to benefit him.

The responsibility, primarily, can rest only with the physician and can be adequately undertaken only when at least some understanding of personality function is present. The masseuse, masseur or nurse cannot, as a rule, be held accountable for the evaluation of the indications and contra-indications entailed in the massage of a given patient. Nevertheless, if the therapist is aware of some of these clinico-therapeutic features entailed in his work, much suffering for the patient will be avoided and more beneficial results fall to the credit of the treatment.

In general, massage should be as carefully prescribed by the physician in charge as would be a dose of strychnin or arsenic. Massage should never be instituted in a psychiatric case by a physical therapist without that therapist first having some understanding of the personality of the patient. It is the professional right of the masseuse or masseur to expect, and even to demand, such information along with the prescription for treatment. No doubt the making of such demands will at first entail rebukes and the need to make explanations, but will, in the end, undoubtedly gain more respect, better results and therefore a more close affiliation with the clinical branches of medicine—the ultimate aim of physical therapy.

Since many indications for and excellent advice regarding massage in psychopathological disorders are to be found in the physical therapeutic and psychiatric literature of the day, the remainder of this paper will deal only with a brief and simple concept of personality function and a few pertinent dangers to be borne in mind when using massage.

A person, sick or well, is a living organism made up of many organs and systems of organs all with their special functions. These functions of the various parts

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are so interwoven and interdependent as to result in a total man with many parts and functions all working together and in interrelationship, to produce a result which we call personality function. Personality function is that which has to do with living in and adjusting satisfactorily to life. Thus, the capacity to remember and to look to the future, to have desires, to perceive and understand sensations, to think, to have feelings of sadness or happiness, and to react or behave in keeping with these functions are as much a function of and necessity for living as is the function of a single organ such as the heart or the muscle system of an arm or leg. As one develops from birth, various personal functions lag behind or precede others until a certain period of life, which we term "maturity," is reached. Within this period, if the patient be well and relatively normal, these functions are welded and amalgamated into a smooth functioning person who meets personal and life situations (within his capacity) without any function, personal or part, being disturbed to the extent of interfering with his or her efficiency, satisfaction and health.

If such a complicated organism meets certain strains in the form of a blow or an infection, his respiratory, heart, stomach, skin or muscle functions may be disturbed temporarily or permanently. Likewise, under certain life stresses, (such as worries, responsibilities, anticipations and misunderstandings), the functions of feeling or emotion, memory, judgment, discrimination, understanding, and others, may be disturbed and this disorder manifested in depression, excitement, restless irritability, odd and queer thoughts, ideas and behavior, or poor memory. Under such conditions, some people react with disturbances that may show more in the form of muscle tension with aching, poor posture, palpitation of the heart, constipation due to a spastic or atonic bowel, sweat gland dysfunction, and so forth—just as blushing may be a skin manifestation of embarrassment.

Thus, it can easily be seen that in any sickness, mental or physical, we must think of a person who is ill and capable of manifesting symptoms of that illness in terms of being more easily subject to certain sensations and manipulations, just as that sick person is more easily subject to excessive exercise or exposure to cold.

In certain people, when they are in the throes of an illness, personal functions (such as remembering, sex urge, perceiving skin stimuli and understanding them in terms of fact), may be involved. It can, therefore, be seen easily that a mentally sick person may be averse to, and be made more tense and uneasy by, the lack of cleanliness of the massagist's hands, the color of her nails (sometimes a factor in this day of modern beauty), the physical appearance and configuration of the masseuse or masseur, the amount or odor of the lubricant used, the lack of skill or awkwardness of the manipulator and the remarks or gestures made by the therapist.

Some patients may be sensitive in certain skin areas and not in others. For instance, a light rhythmic stroking massage maneuver may stimulate a patient to have unpleasant ideas which make for tension and thus neutralize the effect of the massage; or, the fancies resulting may be highly pleasurable and lead to other preoccupations that will interfere with sleep, produce bothersome dreams or lead to a decrease in attention to the activities that will be beneficial to him. Again, some patients, particularly those confused, befuddled and fearful (as in delirium, certain depressions and schizophrenic r actions), may react with impulsive and explosive b havior that may even result in a physical attack on t massagist.

To prevent these adverse reactions which do n benefit the patient and frequently lead to increas morbidity and failure in therapy, the physician, first all, should be in a position to prescribe the massage detail or at least to give the technician a general o ientation in the problem. If the therapist is aware these possible occurrences, treatment can be discon tinued or changed, or at least he can intelligently infor the physician of their presence when they arise.

Restlessness on the part of the patient during a after treatment, a change in mood, a rise in pulse ra a need to pass urine quickly or frequently during o after massage, a slight rise in temperature, poor slee an increase in the tensing of the muscles, the occurren of a sardonic smile, tears, or emotional outbursts shou be heeded as possible warning signs needing furth elucidation and explanation.

A few personality trends and problems, which m occur in the setting of any type of illness (mental o physical), and which should be carefully considere before and in the planning and carrying out of massag since they are frequently *contra-indications* for such procedure, are as follows:

1. Homosexuality.
   - (a) Overt.
   - (b) Latent.
     - (1) Provided this trend plays either a prim ary or secondary role in the disorder o personality functioning.
     - (2) This factor often emerges as a disturb ing element in
       - (a) Psychopaths—i. e., loosely or ganized or immature personal ties.
       - (b) States of temporary or perma nent disorganization such as
         1. Delirium.
         2. Schizophrenic reactions.
         3. Fear and panic states.
     - (3) Psychiatric disorders in patients over 40 years of age in whom skin, genital, gastro-intestinal (lower bowel, rectal and anal), gynecological (pelvic, vag inal, perineal) and nasal complaints, not explainable in actual local disease pro cesses, appear.
2. In tense and agitated depressions with an increase (usually pseudo-increase) in sex urge.
3. Paranoid and paranoic reactions.
4. Hysterical reactions and hysterical personalities.

   If massage is instituted in such instances measures should be taken not to allow atten tion to be given a special part (the involved leg, arms, muscle, etc.). Here, general massage with attention to the part should be used instead of mas sage merely to the involved part.
5. When a tendency, on the part of the patient, to be come dependent (analagous to an addiction) on massage arises.

   This reaction is most apt to happen in the psychoneurotic disorders, in the patient showing

early senile changes in personality, and in the patient recovering from a depression and prone to feel insecure and given to hypochondriasis.

In psychotherapy, massage holds an important position in the armamentarium of physical therapy. It is a valuable and constructive supportive and palliative measure. It should never be used as an isolated treatment procedure in any psychiatric or personality disorder. It should always be considered a therapy requiring individualization. It is an adjunct to be incorporated in the total treatment plan, gauged to fit the needs and problems of the patient, and if so used will do much to further the cooperation and essential close relationship of physical therapy with medicine as a whole.

The Use of Rubber Bath Sponge in Giving Foot and Leg Exercises

Kathleen Lyons, R. N.

A common rubber bath sponge, about five inches by three inches and two inches thick, scooped out in the center to make a depression large enough for a patient's heel to fit into comfortably, is an excellent means of eliminating friction in giving exercises. The sponge must be saturated in talcum powder as this aids in the process of gliding easily over the table surface or the work board. This method has proved of value in giving various exercises. For example:

A. Side lying—affected side down.

Place external malleolus on sponge depression. This relieves pressure on the bony prominence of the ankle and raises the limb from the table enough to eliminate friction.

Exercises:

1. Inversion of ankle.
2. Setting exercise for peroneals.
3. Plantar flexion of ankle.
4. Flexion of knee.
5. Extension of knee.
6. Flexion of hip.
7. Extension of hip.

If the knees are bony, a sponge can be used under the knee and ankle at the same time in giving the hip and knee exercises. If there is any difficulty in keeping the sponges in place, they may be fastened by sewing tapes to either side, leaving the bottom free.

B. Side lying—affected side up.

A piece of three-ply veneer board, sandpapered and shellacked, may be supported on pillows, sandbags or boxes. The affected leg rests on the board and the supports are high enough to prevent pressure of the board on the opposite leg. The internal malleolus rests in the sponge cavity. The same list of exercises as described above may be given in this position. It is a more favorable position for weak tibials since the foot rests in slight inversion. An effective setting exercise may be given for weak anterior tibial and posterior tibial.

The exercise board may be tilted at different angles to change the effect of gravity in giving exercises to hip and knee muscles.

If the peroneals are weak and the tibials strong, affected side down is a better position since the foot rests on the sponge in the position of eversion.

C. Back-lying—Heels placed on sponge depression. This helps to prevent outward rotation of the hips and eliminates friction from the table.

Exercises:

1. Abduction of hip.
2. Adduction of hip.

D. Face-lying—Sponge under the knee to relieve pressure of the knee on the table.

Exercises:

1. Knee flexion—against gravity.
2. Knee extension—gravity helping.
3. Hip extension.

This simple method has proved useful in giving the exercises mentioned. Naturally the choice of exercises would be determined by the muscle weakness in each individual case.

In a similar way, the sponge might be used to work out exercises for the hand and arm.

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Technic of Cleft-Lip and Cleft-Palate Massage

Pauline Plummer, R. N.

Massage following the repair of cleft-lips and cleft-palates is of great importance. What are we trying to accomplish? We are trying to get rid of scar tissue. With proper technic, time and perseverance, we can accomplish this very thing. Improper technic will be either of no value or cause more scar tissue. As a baby's lip is very delicate, clumsy fingers sliding over the surface of the skin are very apt to break through and cause more scar tissue, thus doing more harm than good.

For example, let us take a repaired unilateral, incomplete cleft of the lip, which is the simplest type of a scar. The oral surgeon has done a beautiful repair, but the scar may still be a little red and there is a fine line where the lip was closed. As compared with the appearance of the baby before the closure, the lip looks very well. The mother is pleased. On examining the lip, we find a scar much thicker than it actually appears, and on the inside the lip is adhered to the gum. The lip and the gum are even and it is impossible to run the finger along the inside as you could on a normal lip. Would we find this same condition, for example, in about six to eight weeks, or would we find the scar had thinned out some by itself? What we usually find is a puckering of the scar, thus drawing the lip up and giving it a short appearance where it has been closed. The scar feels thick and woody, and of course the adhering of the lip and gum still exists.

Usually a baby is discharged from the hospital one week after the operation; the stitches are out and the lip is healed, so there is no danger of infection. The mother is instructed to return to the dispensary the following week for observation. The oral surgeon usually orders massage to be started at this time, which is two weeks after the lip has been repaired. Massage of these lips is a teaching project because it is important to give the treatment four or five times daily. Proper technic is demonstrated to the mother and she is told in detail how to successfully give the treatment at home.

It is quite a trick to hold these youngsters and at the same time administer the treatment. The simplest way to accomplish this is to place the baby on a table and, if possible, have some member of the family hold the hands and feet. This is necessary as these youngsters put up quite a fight in the beginning even though they are only a few months old, ranging anywhere from two months on. There is the father to contend with in some instances, as sometimes he is asked to hold the baby, or is at home when some of the treatments are being given. One mother said the father was harder to manage than the baby. He would walk the floor and say, "You are not doing it right or the baby wouldn't make such a fuss." It was suggested that she give the treatments when the father was not at home. This advice came a little late as she replied, "That is the way I have been doing, nurse."

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When the mother has to give the treatment alone, the baby may be wrapped in a sheet like a "mummy." In this way the mother, without assistance, can hold the head and manage to massage the lip at the same time. She is cautioned to always wash her hands before starting a treatment. No lubricant of any kind is used when massaging the lip as it would only cause slipping of the fingers. It is also well to have a piece of soft linen handy to press firmly on the lip to absorb any moisture. The lip must be kept perfectly dry while being massaged.

Fig. 1. Unilateral cleft lip.

The mother is shown how to place the baby on the table with the head near the edge and to stand directly behind. By cupping her hands around the head, the thumb and fingers of the right hand are still free to give the massage. Both hands are in place and when the baby struggles, or attempts to turn the head from side to side, the hands automatically clamp down on the head, so to speak; when the baby stops resisting, the hands are released but of course kept in place ready for the next quick move from the baby. It is surprising how soon these small babies learn to hold still as nothing is tight until they make it tight by moving. Good training from the very start is essential and once these youngsters are conquered, the actual treatment is simplified.

First step: The treatment is started by placing the thumb directly over the scar. A rather firm, rotary motion should be used, but the thumb should not be allowed to slide over the skin surface. This can be demonstrated to the mother on the back of her hand as it not only gives her an idea of the amount of pressure used, but it also gives her a clearer picture of ironing out the scar. The scar in the beginning usually feels like a small lump. The mother is instructed to imagine

Fig. 2. After closure.

Fig. 3. End result.

this is a small "pea" which she is trying to crush. She is also told to do this rotary motion at least twelve to fifteen times before lifting the thumb; this gives her a chance to feel the scar. She will also notice, when the thumb is lifted from the scar, that the lip is momentarily white but immediately turns red as the blood rushes in when the pressure is released. The mother is instructed to give the treatment but once the first day, spending about ten to fifteen minutes. The number of treatments is increased one each day until she reaches four or five times daily. She is also warned to stop the treatments for a day if the lip appears unduly red or irritated. Before leaving the dispensary after the first demonstration, the mother is told to return in a week for observation and further instruction, at which time she will be asked to give the treatment so that it may be observed if she has been doing it correctly. When the mother knows in advance that she is to give the demonstration she is prepared, otherwise she becomes very self-conscious. After the mother has given the treatment for one week, it is surprising how well she does it. She is usually told to return every two weeks after she seems to understand little details, and then later on once a month.

Second step: After the scar has begun to soften, the mother is instructed to place the fore-finger where the gum and lip meet and to attempt to roll the lip over the finger. Little by little the finger is forced under the lip, and at the same time, the thumb is directly on the scar and the same rotary motion is done as in the first step. She is also to continue with the first routine. It is well to caution the mother frequently never to slide the thumb over the skin surface.

Third step: When the scar has become thinner, and the finger can be forced up under the lip, the thumb is placed on the outer surface and the scar is rolled between the finger and the thumb. Another method of helping to free the lip from the gum is to pick it up on each side of the scar, and with the scar between the thumb and fingers of each hand, do a rubbing motion. This is best explained by imagining you were washing out a soiled spot in a garment. Another method is to hold on to the edge of the lip in a direct line of the scar and give quick, short, vibrating downward jerks, possibly fifteen or twenty before letting go of the lip. This may be repeated four or five times during each treatment.

The technic for massaging a more extensive repaired cleft of the lip is the same as has just been described. Scars are scars whether they are due to a bilateral complete cleft of the lip or unilateral incomplete. The only difference is that the bilateral complete cleft may take a little longer time as the scar is more extensive.

The technic for holding the child for massage of the palate is the same as has just been described above. The mother is cautioned to never massage the palate unless she is sure the stomach is empty. To do an effective massage on the palate, the finger must follow along the junction of the hard and soft palate. Of course this causes more or less gagging. It is a protection to the one giving the massage to be standing behind the patient as previously described, for there is apt to be coughing and spraying of mucous from the nose and throat. When the child is a little older, there is the problem of the teeth. It is surprising the amount of strength these youngsters have in their jaws and they do not hesitate to make use of it for their own protection. It was quite a problem for some time to discover what could be used to hold these mouths open. A mouth gag was tried, but that seemed a little drastic and did not solve the mother's problem, for of course she had no mouth gag at home. Five or six tongue blades fastened together with adhesive served the purpose fairly well but there was danger of either letting them slip out from between the teeth or jabbing them back in the throat. Sometimes the mothers used a clothes pin at home. One day an Italian mother who did not speak or understand a word of English returned to the dispensary for a treatment and, through an interpreter, said she was successfully using a cork between the teeth. This proved to be ideal. The size of the cork used is just a trifle larger than the finger. It is placed between

the teeth on one side and held in place with the left hand while the middle finger of the right hand is used to massage the palate, and in the meantime the hands are cupped about the lower jaw of the child.

The mother is instructed to place the middle finger far back into the mouth and with a firm pressure slowly run the finger along the junction of the hard and soft palate, bringing the finger toward the roof of the mouth and at the same time back toward the tonsils. This motion to be repeated three times and then the child is allowed to rest. The finger is then placed in the same manner on the other side of the mouth and repeated three times. The child is given another rest period. The next motion is to run the finger along the scar in the roof of the mouth, starting at the anterior portion and continuing back toward the tonsils to the soft palate; this is also repeated three times and then another rest. Then a rotary motion directly on the scar is done. It is important to get rid of scar tissue of a repaired palate as a short soft palate is a handicap to the child's speech. These youngsters are all referred to the speech clinic for training. The mothers of these unfortunate cleft lip and cleft-palate youngsters are exceptionally cooperative in keeping appointments and giving treatment at home. There are "busy body" neighbors and relatives who still point their fingers at the parents and say "It is your fault that child was born that way." This is probably one of the reasons why the mothers are so faithful throughout the whole procedure. The most sincere thanks come from the lips of these appreciative mothers when they are told the work is completed and they need not return to the clinic. The length of treatment varies from six months on, depending upon how early the repair was done and whether it was a unilateral incomplete or a bilateral complete cleft of the lip.

Inequality of Limb Length in Residual Paralysis from Anterior Poliomyelitis

C. W. Peabody, M. D., and N. Graham

Among the important physical defects and handicaps frequently residual from the ravages of infantile paralysis is that of inequality of length in the lower extremities. While in most instances this may not be significant in amount, unfortunately for many children it is notably so. Before maturity is reached, in cases where one limb has escaped with the fellow member involved, there is often an inequality in length of as much as two inches, and less frequently greater amounts up to three and a half to four inches in a tall individual. In a great many cases it is possible to restore stability and functional efficiency by the reconstructive measures of orthopedic surgery, but this leaves a residual limp which is due almost entirely to the shortening.

Aside from the gait disturbance produced by the shortening, it will cause, without compensation, a postural scoliosis which will inevitably be progressive should the trunk muscles also be slightly impaired, and in any event will provide a basis for chronic back strain in later life. Compensation can be provided by an extension shoe; but the necessary build-up in cases of the maximum shortening makes the shoe very unstable and when worn on a limb itself weakened in stability, it is very difficult to control. Also, since it is heavy, it is an additional source of fatigue in the weakened limb. Any shoe that compensates for several inches of shortening has to be made to order and is a constant expense through life. It is unsightly at best for anyone to wear, but girls and women feel this more acutely than the atrophy or other abnormalities of the limb itself.

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Without compensation, a disfiguring postural distortion of the body is added to the abnormality of the limb, and since most of the shortening is below the knee, the inequality in the limbs is even more manifest in a sitting position than when standing.

Medical science has available four different measures for control or eradication of this deformity of inequality. Of course, they are—or should be—utilized only where the shortening is of significant amount (more than 1½ inches), when it is a major factor in the gait disturbance, and when the limb can be or will be made independent of apparatus. The first of these four to be mentioned should perhaps be limited to individuals whose normal stature is average or above. It consists of a rather minor operative procedure which arrests further growth on the sound or longer side in those epiphyses which contribute mostly to the normal elongation of the limb. The number of epiphyses to be arrested and the age at which the operation should be done is determined by the amount of inequality. In instances of marked inequality, the procedure must be carried out quite a number of years before growth is complete, and it is not always easy to predict the rate of future asymmetry in growth in a poliomyelitis case accurately enough to determine the ideal or proper time for arrest. The resultant restoration of equality in length obviously comes very gradually and is not arrived at until full maturity. Accordingly, this procedure is still not very extensively utilized in infantile paralysis, although its principles and technic were developed and introduced a number of years ago by Phemister of the University of Chicago.

The second available measure is an operative procedure to actually shorten the bones in the normal or longer limb by a technic of resection or overlapping. Because of technical difficulties, this measure has been much used only in the upper half of the limb (i. e., the femur), where two to three inches of shortening can be produced. Its principle exponents in this country are White and Key, but the measure has not been widely accepted, possibly because of the considerations below. Logically it is more appropriate in its application to shortening due to diseases or deformities of the hip which cause a shortening entirely above the knee, and where the lengthening procedure is more difficult, than it is to the poliomyelitis case where the shortening is much greater below than above this joint. Equalization of leg length in poliomyelitis cases by shortening the sound side above the knee leaves the individual when in the sitting position obviously with an enhanced discrepancy in symmetry. Furthermore, since there are undeniably certain risks of permanent functional impairment of the sound limb in this measure, it is found that consent usually cannot be obtained either from the patient or the parents. On the other hand, its exponents argue—and often with good logic—that the impaired limb may become less stable if restored to its normal length. At the least, this measure represents a fairly formidable surgical procedure with a rather long convalescence.

The third measure is that of surgical elongation of the bones on the short side, usually below the knee. This is a well standardized procedure now, due to the brilliant contributions of Abbot, Key and Crego in this country, and hundreds of children have been relieved thereby of this handicap. It is a major and technically difficult procedure requiring a long period of hospitalization and a convalescence that is rarely complete to full activity in less than a year. It also carries certain hazards which, although greatly reduced by experience, are still factors for consideration.

The retardation of growth in length that so often results in the presence of residuals of infantile paralysis has long been a rather puzzling phenomenon. For a long time it was considered due only to disuse or to lack of the stimulation of normal muscular activity. On the other hand, we have pointed out that there was no consistent relationship between these factors and the amount of shortening observed; limbs having a complete paralysis below the hip will sometimes show not more than one inch of shortening, and others, with no loss above the knee and incomplete loss below, will have as much as two inches difference in length. Again, the child who has been kept ambulatory after the acute phase will sometimes show greater loss than one who for many years was unable to walk on the affected limb because of lack of apparatus or control of deformities.

There is, however, a factor that we have observed to show a consistent relationship to the degree of retardation in growth following poliomyelitis; namely, the degree of concomitant circulatory disturbance. The latter, of course, is familiar to all who observe these cases but especially so to those situated where the winters are rather cold. In very low temperatures, the children, no matter how heavily clothed, often complain bitterly of the peculiar discomfort in the affected member and are rather susceptible to skin lesions of the character of chilblains. In any cold weather some of these limbs uniformly show a strikingly cyanotic appearance and are cold and clammy to the touch. Although this phenomena does not follow the degree of muscular defect very accurately, it is closely paralleled by the degree of shortening.

For purposes of comparison, there are no other common disorders of early childhood which result in this sort of circulatory disturbance and which, accordingly, might be studied as to a similar effect on bone growth. However, some light is thrown on the situation from the converse side. It has long been observed that any long-continued low grade inflammatory disturbance of the knee joint with local hyperemia will result in relatively greater growth activity in the involved epiphyses and add slightly to the length of the limb. Incidentally, we have been able to reproduce this effect to a limited degree by artificially produced hyperemia over long periods in shortened limbs, whether or not the seat of an existing circulatory disturbance. It has also been observed that chronic osteomyelitis with low-grade inflammation persisting over years will lengthen a limb from one to two inches where the disease has not reached the growth centers themselves.

Accordingly, it may not be illogical to assume that if a persistent increase in regional blood flow and capillary dilatation will accelerate epiphyseal growth, the reverse effect can be expected in the condition of retarded blood flow and capillary contraction which seems to be a consistent accompaniment of the retardation of epiphyseal growth observed in these poliomyelitis cases. It also seems possible to see a physiological and pathological explanation for the coincidence of circulatory disturbance in infantile paralysis residuals. Remembering that the primary etiological and the persistent lesion of this disease is in the spinal cord, that the peripheral blood flow is controlled mainly by the extra-spinal autonomic or ganglionated cord, and that these two cords have inter-connecting nerve branches at regular levels, it can be inferred that lesions in the spinal cord itself may produce accompanying disturbances at corresponding levels in the functions of the ganglionated (sympathetic) cord.

It remained for Harris of Toronto to make the first practical application of the reasoning from these various clinical factors. About fifteen years ago, Royle, of Sidney, stimulated by the investigative work on the autonomic cord by the late Hunter and himself, was led to believe that ramisectomy of the sympathetic cord was capable of notable ameliorative effect in spastic paralysis. In the course of a tour around the globe demonstrating this surgical attack, Royle operated on several hemiplegics in Toronto. Harris, following these cases closely over a period of years, was surprised to observe, along with the peripheral vasodilatation resulting from the operation, a relative increase in the length of the limb on the side of the operation. Correlating this observation with those detailed above, he began applying an improved operative procedure (i. e., ganglionectomy), in children with shortening from infantile paralysis. (His first published report on these cases was made before the American Orthopedic Association in 1930 and a supplementary report was published in Bone and Joint Surgery, January 1936.) In all cases done, the operation resulted in a cessation of the increasing discrepancy in the limb length, and in 75 percent some catching up was observed in the course of a few years—amounting, however, to one inch at the maximum.

Early in the course of his work, we became acquainted with Harris' conception and its application. It seemed to us that its most certain results could be achieved if carried out fairly early in the course of the chronic phase of residual poliomyelitis. The cooperation and assistance of our own consultant in neuro-surgery, Dr. Frederic Schreiber, was secured, and we began to watch very closely the tendency to shortening in our newer cases, and also the coincidence of peripheral circulatory disturbances. Whenever, in the course of two or three years, there developed a notable inequality —usually at least an inch—Doctor Schreiber carried out the indicated ganglionectomy on these patients. The first of these operations was done six years ago, and up to a year ago a total of sixteen have been operated upon for this purpose. A few of these children have shown a reduction in the amount of inequality, all but three have shown complete cessation of the progressing difference in the leg length and remain with amounts too slight to constitute in this respect any important physical handicap. Two cases showed a further increase of one-half inch and only one in excess of this.

In all cases, the limb on the operated (paralyzed) side has lost its cyanosis and clamminess and become as comfortable as the other, even in severely cold weather. For the first year or two, the limb on the operated side became the warmer and drier of the two. This difference has seemed to gradually recede in later years, but in no case have we seen the original condition return. Accordingly, our experience has seemed to be adequately confirmatory of that of Harris and to support the great value of his contribution in this respect.

Accordingly, we believe it can be safely stated that in addition to measures available to bring about equality in limb length in infantile paralysis cases after marked shortening has occurred, there is a dependable procedure to prevent the development of any important amount of shortening. Also, it should be emphasized that there are valuable secondary advantages in this measure. In many instances, we have been assured that the intervention would have been worthwhile regardless of any effect on limb length from the greater comfort enjoyed in the winter months. It would also seem that the better blood flow and nutrition would make for the greatest possible development of what residual muscle power there may prevail. Obviously, then, the situation now carries a challenge to orthopedic surgeon and physical therapist to maintain careful observations on these two factors in the early post-paralytic years; namely, circulatory disturbance and appearance of growth retardation so that appropriate intervention can be brought to bear at the most favorable time.

The Library of the American Hospital Association

W. P. Morrill, M.D.

The service of the Library of the American Hospital Association is unique in several respects.

1. It is the largest library in the world devoted exclusively to hospital problems and the closely allied problems of nursing, both education and service, and medical social service.

2. Its package library service includes clippings from all the journals published which are devoted to its special subject. These clippings are assembled by topics and thus each package library becomes a collection of all current thought on that particular subject.

3. Its service is not limited to the members of the American Hospital Association but are extended to any responsible person in any place in the civilized world who has a legitimate interest in the subjects requested.

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BOOK COLLECTION

The book collection, about five thousand volumes, includes not only those of current interest but a large number of books of unusual historical interest. All books are indexed, classified, and shelved according to a specially devised system which renders them quickly available for study purposes.

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MAGAZINE COLLECTION

The journal collection includes both current and back numbers of more than one hundred fifty periodicals of hospital and related interest, many of them complete to date of first publication. From one to ten copies of each issue are received by the library and after reserving one for the permanent file and binding, the surplus numbers are used for the assembling of package libraries.

PACKAGE LIBRARIES

The package libraries consist of collections of current articles assembled according to topics discussed in the subject matter and bound in a tough binding cover paper. The library now has available for distribution slightly more than five thousand such collections on over

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nine hundred topics and is adding new ones at the rate of over 300 per year. Some of the annual additions are to cover the newer topics such as air conditioning, hospital service plans, the new nursing curriculum, etc. Others are for the purpose of bringing older topics up to date. The number of separate packages on each topic varies from one to as high as fifty-five according to the demand for the particular topic and the amount of material available. The library has available for distribution mimeographed lists of the topics covered and the use of these lists is of material assistance to those desiring the material in helping them to formulate their requests as to be readily understandable. For those who do not use these lists, the library personnel makes every effort to interpret their requests but some are couched in such indefinite or broad terms as to make such interpretation difficult if not impossible.

Bound volumes of journals and text books are available for consultation in the reading room of the library but in the case of some of the more important ones such as reports of study committees and in case of some text books, the library has duplicate copies which may likewise be loaned.

No Restrictions on the Loan Service

One outstanding feature of the loan service of the library is its generous freedom from restrictions as to recipients of its service. Loans are made to any responsible person who has a legitimate interest and can be reached by the Postal Union. Every civilized community in the world is served without restriction and the influence and work of the library is just as definite in China, Persia, Africa, or New Zealand as in its headquarter's city, Chicago.

For those who are able to visit the library there is available a large reading room and the personnel is always ready to give any possible assistance in the formulation of plans or search for material for special studies.

The reading room is also available for group meetings and twelve organizations representing hospital and allied interests regularly avail themselves of this convenience.

The service of the library is free to all comers. Applicants within the continental United States are requested to return loaned material within three weeks though this time may be extended if special request is made to the library. Applicants from without the United States are permitted to retain material for a period of six weeks and even this generous allowance may be extended if good reason for such extension exists. The library pays transportation charges on outgoing material and the recipient is asked to pay return transportation only.

Hospital Plans and Specifications

Included in the loan service is an extensive collection of blue prints of hospitals built largely in the period of 1920 to 1930. The small amount of building since 1930 has not made many of the later ideas in hospital planning available but it is hoped that with the recent increase in hospital building activities some of the newer plans embodying the later ideas in planning may be made available in the not distant future.

Hospital Annual Reports

Until about 1932 a rather extensive collection of annual reports of hospitals was maintained. At about that time there came a marked decrease in the publication of such reports by hospitals and the collection for the years since that has been less comprehensive than formerly.

With the much increased activity now evident in the hospital field it is hoped that the publication of annual reports will be resumed and that the collection on file in the library can be made more representative.

The Extent of Service

During a typical service year, four thousand five hundred package libraries and fifteen hundred other types of material were sent in response to applicants in the United States and in nineteen foreign countries. The applicants were not only hospital administrators and executive personnel but included representatives of all types of persons interested in hospital, medical, and sociological activities. One large group of applicants consists of nurses—executive, graduate and undergraduate—who are making special studies or writing theses on various subjects relating to the care of the sick.

In addition to the mailed out material some eight hundred visitors to the library were furnished material for use in the reading room. These visitors represented not only all sections of the United States but many foreign countries as well.

One of the newer activities of the library is its endeavor to help those whose problems are not covered in the available literature. Included in the personnel of the library are a specially trained and experienced librarian and a hospital administrator of extended experience, both of whom have wide contacts with technical personnel in other lines of endeavor. Through these contacts it is often possible to secure data and prepare bibliographies or memoranda on the special problem presented.

The Support of the Library

The library is supported entirely from allotments of funds from the regular budget of the Association which in turn is derived solely from the annual dues of its members. There are no special grants, subsidies, endowments, or other special funds available for extension of the work of the library. Due to such limitation of funds the library has an extremely small budget for the purchase of books and periodicals and thus must depend almost entirely on the generosity of publishers for its new material.

For similar reasons it has not yet been possible to extend the service very far in the direction of original research, a field which would be of marked value to the hospital field but which can not be undertaken until such time as increased appropriations are made available either from increased membership in the Association or from special grants or endowments from sources outside the regular budget of the Association.

The Library is essentially a service rather than an archive organization. Its every effort is directed toward day to day service to all who are interested in hospital problems. Its aid in assisting all those concerned in hospital work cannot fail to improve the quality of work done and to benefit all those whose infirmities bring them to the hospital door.

A Posture Clinic for Elementary School Children

Elizabeth Powell

A posture clinic for elementary school children is conducted each year during the winter season (November to April) by the Department of Hygiene and Physical Education at Wellesley College. Children are recommended for the clinic by the second year professional students in the department who do supervised teaching in the Wellesley public schools, by the school physical education teachers and by the school nurses.

At the first clinic of the season a thorough posture examination, including side and back view photographs, is made by Miss Katherine Wells, director of the clinic and instructor of individual gymnastics and reconstructive hygiene in the Department of Hygiene and Physical Education. Dr. Andrew R. MacAusland, the consulting orthopedic physician for the clinic, comes once a month to examine the children referred to him by Miss Wells.

The exercise programs are made out and taught under the supervision of the clinic director by the second year professional students on the basis of the examination findings. A summary of the findings is sent to the parents together with suggestions for home cooperation. A check-up examination is given at the end of the clinic season.

The average attendance at the clinic is about forty, with a total enrollment of about fifty-five. The cost is fifty cents for the first time and ten cents thereafter. These fees are used to cover the cost of secretarial assistance and incidental expenses.

The chief accomplishment of the clinic is teaching the children to assume good standing and sitting positions without tension. So many times children and parents have the mistaken idea that "ram-rod" posture is wanted. Poise, and good alignment of the body segments are practiced over and over again so that the children learn what an easy erect bearing feels like and looks like. Many of the exercises are practiced before the mirrors, others in the lying position—always under careful supervision, however, because incorrect execution of the exercises is apt to do more harm than good. The parents who accompany their children to the clinic have an opportunity to find out how to help in everyday applications of what is taught in the clinic. An attempt is made to give them some understanding of how they may help their children to make good postures habitual.

From the point of view of the graduate students who plan and teach the individual exercise programs, the clinic serves as a practical laboratory, giving them valuable experience in dealing with the posture problems of elementary school children.

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The Role of Surgery in Spastic Paralysis

Newton C. Mead, M. D.

Spastic paralysis, one of the most common disorders seen at institutions specializing in the care of crippled children, continues to be a discouraging condition to treat. Because of the location and nature of the lesion which causes the condition, there is no likelihood of this situation changing in the near future. It is of great importance to these patients, however, that we take advantage of all the available methods of treatment and do not rely wholly on one or two. In this discussion of the part surgery plays, it is not intended that undue emphasis shall be placed upon this phase of the treatment.

The lesions causing spastic paralysis in children are not usually confined to the pyramidal tracts. Very frequently they are diffuse enough to involve the extra-pyramidal motor systems (basal ganglia), and in nearly all cases the cortex of the patient is impaired and mental changes are present. Very often this mental deficiency dominates the picture and is more important than the mechanical handicap. In many cases another factor of importance is present. This is emotional instability due to maladjustment to the environment, and it is largely responsible for the severity of the symptoms and the lack of cooperation which these patients so often exhibit. If these facts are not carefully considered before planning the treatment of each spastic, much futile, or perhaps harmful, surgery will be done.

Spastics are usually brought to the orthopedist with the idea of getting the patient up and walking. We must remember that walking is the result of several factors: First, there must be the desire on the part of the patient for upright progress, along with some appreciation of what walking is; second, there is required a sense of equilibrium, as well as sufficient coordination between the mind, the motor centers, and the muscles themselves to make progress possible; third, the mechanical apparatus must be in good enough condition to make walking possible if the other factors permit. Surgery is very important in improving this last factor, but it is to be understood that this mechanical system is not the primary consideration. The factors of mentality, psychology, and neuromuscular coordination must be considered as basic. If this concept is correct, surgery assumes the role of an adjunct to the fundamental treatment which consists of: first, education, using proper psychologic principles in an attempt to bring about a proper relation of the patient to his environment; second, training directed toward coordination between the higher nervous centers and the muscles; and third, the local stretching and proper development of the spastic muscles themselves. With this in mind, a definite rule can be made: *No operation to improve the mechanics of walking should be done until the patient will attempt to stand, step and balance himself with a fair degree of success.* It is not difficult to determine by a little study how much of the inability to stand is due to the deformity and how much is due to more fundamental factors.

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An unpleasant part of every orthopedist's practice is the large number of "mental" spastics which are brought to him for treatment. Typical of this group is the child four or five years of age, who cannot talk, feed himself, sit up, or even make purposeful movements. The parents of such children often insist that their child is normal mentally and "understands everything we say." The surgeon must not be influenced by this unfounded optimism. There is no benefit from any type of surgery in these cases at this stage. The parents should be instructed to keep trying to interest the patient in something, so that the simpler kinds of occupational therapy may later be of avail. When the intelligence quotient is very low, walking is not an advantage, for the patient is more easily cared for and is just as happy remaining on his bed. The importance of an accurate determination of intelligence is, of course, obvious.

In cases showing many uncontrolled athetoid movements as the result of extra-pyramidal lesions or emotional disturbances, we cannot expect much from surgery, for it is not directed at the most important part of the disturbance. However, when these patients develop definite, disabling deformities, such as unstable equinovarus or marked adduction of the thighs, surgery is definitely indicated, for it not only overcomes the deformity, but it gives the patient more confidence and enables the other forms of treatment to be more effective.

The spastic with epilepsy is another problem. When the attacks are frequent, the spastic and mental condition usually becomes progressively worse. The main treatment in these cases should be directed at the epilepsy rather than at certain spastic muscle groups, though these latter should not be neglected. When the patient, under treatment, is improving in mentality and coordination, the same rules for surgery will apply as if the patient had no epilepsy.

The most common deformities of spastic paralysis are these: First, in the hip there is adduction, internal rotation and occasionally, flexion deformity. The knee is often involved in flexion deformity, especially in the more severe grades of paralysis. The hyperextended knee is not often seen, though occasionally it is present and very troublesome. Deformities of the foot are very common, the most common of all being equinus, and this may be associated with varus of varying degree. Valgus deformity is less common but is far from rare. Calcaneus is also seen. The upper extremities most often present the characteristic picture, which consists of flexion of the elbow, the wrist, and pronation of the forearm. The fingers are flexed, either slightly or to an extreme degree, even to the point of cutting the skin of the palm with the finger nails.

These deformities are usually not due to actual contracture, the deformity largely disappearing during sleep, or when the patient is emotionally calm, but appearing in exaggerated form when patient is agitated. Certain of them become contracted secondarily,—equinovarus and wrist flexion, for example, very often be-

coming quite rigid. Nearly all deformities, if neglected, will finally become complicated by actual shortening of the muscles and tendons causing the deformity.

When there is actual contracture present, surgery is always to be considered, for physical therapy and occupational therapy alone will not overcome the deformity. Tenotomy or plastic lengthening of tendons usually will give at least temporary relief from deformity, but since the uncontrolled contraction of the spastic muscle may continue, the procedure may be necessary more than once. Finally, as the tendon is lengthened greatly, and the muscle continues to contract, there results a small knot of muscle with very little function left. The importance of other methods in maintaining the improvement is obvious.

In spastic children with simple equinus one must carefully differentiate actual structural shortening of the calf muscles and tendons from physiological contraction due to the excitement and increased tone of the muscle. A tendon lengthening may be done when there is contracture, but when the trouble is uncontrolled contraction, which will not respond to non-surgical measures, best results are obtained by excision of certain of the muscular branches of the tibial nerve. Between the heads of the gastrocnemius in the lower part of the popliteal fossa can be located two large muscular branches of the tibial nerve, one of which supplies the lateral mass of the soleus muscle, and the other the medial mass. In moderate cases of equinus only the lateral nerve need be removed. In severe cases the lateral and part of the medial nerve are removed, and in very light cases, only a portion of the fibers of the lateral nerve should be excised. One need not be afraid of completely paralyzing the calf for there are numerous smaller branches from the tibial nerve which enter the soleus muscle below this point. This neurectomy is also advisable in cases in which tendon lengthening is done, for it will help prevent recurrence of the deformity with shortening of the muscle mass. If equinus is neglected, sooner or later the foot will become unstable and require operative stabilization.

In the case of the rigidly contracted equinovarus spastic foot, which is unstable, the procedure of choice is invariably triple arthrodesis with removal of enough bone to correct the equinus if possible without tendo Achillis lengthening. Sometimes it is necessary to lengthen the tendons secondarily. The deformity rarely recurs after this treatment. Unstable valgus feet also do well after triple arthrodesis.

The knee flexion deformity presents a difficult problem. A number of procedures have been used, none with very marked success. Tenotomy of the hamstrings will sometimes be sufficient, but usually it leads to poor control of the knee and a gait which is no better than that which was present before operation. This poor result is due to the fact that the patient is accustomed to the deformity, and his quadriceps muscle is stretched and the patella tendon lengthened, so the function of the extensor muscles is impaired and the knee cannot be extended well, even after it has been relieved of the flexor pull. To overcome this type of result the hamstrings have been transplanted to the patella. At first glance this seems like a logical procedure, but it has often resulted in a poorly controlled knee or a secondarily hyperextended knee. Also, since spastics have such poor muscle control, we cannot expect them to use transplanted muscles to great advantage, for this is difficult even in patients with normal coordination.

Advancement of the patella—moving its attachment at the tibial tubercle to a lower point on the shaft—gives promise of better results, for it gives the extensors, which have been stretched, a new opportunity to function. The procedure is more difficult of accomplishment than one would think, for in the hands of many operators there have been secondary sloughs and infections resulting from the constant attempts of the quadriceps to contract, thus finally pulling the improved attachment loose and even causing a gaping of the incision. The prevention of this complication requires the constant maintenance of the correction until the healing is complete and the patellar tendon is completely fast in its new location. This may be accomplished by inserting a Kirshner wire through the patella and maintaining traction by means of a turnbuckle attached to the distal portion of a straight knee, thigh length plaster.

Excision of motor nerves to the hamstrings has been a disappointing procedure in the past, but it may be more useful now, following the patella advancement. Obviously, if the patella advancement alone is done, the knee may still be subject to the same forces which brought about the deformity in the first place. It is dangerous to rely on physical therapy, useful though it is, as the only preventive measure. It seems only reasonable that an operation to decrease the excessive tension of the hamstrings should be done also. In this way the deforming element can be overcome and the stretched and handicapped extensor forces are restored to function without a handicap. A tendon lengthening or tenotomy of the hamstrings can also be used with the patella advancement.

Genu recurvatum, or the hyperextended knee, is not common in spastic paralysis. When it occurs, it is the result either of rigid equinus and incoordination, or it is caused by transplanting the hamstrings into the patella. After overcoming these causes, education and temporary bracing may be sufficient to correct the deformity, but occasionally surgical correction is necessary. Satisfactory back knee stabilization is difficult to obtain. Our best results have followed the use of the fascial stabilization recently described by Carrell.[1]

Adduction deformity of the hips is, excepting equinus, the most common deformity of spastic paralysis. When bilateral it results in the familiar scissors gait, a very disabling deformity, which usually responds poorly to non-surgical treatment. Even rather slight degrees of adduction interfere with proper walking and contribute to other deformities such as equinovarus. Obturator neurectomy will nearly always give great relief. The conservative procedure here, using only a small incision over the adductor longus tendon, will generally suffice. This incision enables one to obtain the two branches to the anterior group of adductors, which are mainly responsible for the deformity. There is another main branch of this nerve which leaves the main trunk high, and is, therefore, less accessible. This supplies the adductor portion of the adductor magnus and a minor part of the adductor brevis, but since these fibers do not add greatly to the deformity and are very important to the function of the thigh, it is best not to disturb them except in unusual cases. It is possible to so weaken the adductors that a very awkward gait with the legs in wide abduction results. It is not being too dogmatic, then, to state that the conservative obturator neurectomy is indicated wherever spastic adduction interferes with proper locomotion.

1. Presented at the annual meeting of the Clinical Orthopedic Society, Oct. 31, 1936, Dallas, Texas. (Not yet in print.)

Internal rotation of the thigh ordinarily accompanies adduction, but it is usually controllable without surgery once the adduction is overcome. However, when it is of marked degree it presents a definite interference with proper gait. Since the gluteus medius and minimus are the most efficient internal rotators in these cases, and since these are quite accessible at their insertion into the greater trochanter, they are the logical structures to attack. Simple division of these attachments, subperiosteally or otherwise, is an excellent procedure in correcting this deformity. At the time of operation it may be found that the tensor fascia lata tightens markedly when one attempts to externally rotate the thigh, and if this is the case, the fascia may be divided. The gluteus medius and minimus are always found to be definitely contracted, even when the patient is under deep anesthesia. The loss of the abductor function does not seem to bother these patients.

Apparent flexion deformity of the hips is not the result of contracture ordinarily, but is due to attempts of the patient to maintain balance. The deformity never occurs alone, but is secondary to other deformities. Posture education with prolonged training in balance will obtain results when the patient is otherwise restored to the upright position. Surgery is very rarely indicated, but if it must be done, release of the contracted structure attached to the anterior superior spine and anterior inferior spine should be of value. In my experience no case has been seen in which the psoas had to be disturbed surgically.

In treating the upper extremities we are much more successful with physical therapy and occupational therapy than with any other agents, for the disability is nearly always one of poor coordination. Occassionally, however, when pronation deformity will not respond to other treatment, it is advisable to assist this work by surgically sectioning the pronator teres at its insertion on the lateral border of the radius, and by excising the accessible branches of the median nerve which supply this muscle. Extreme flexion of the fingers and wrist, whether rigid or not, is difficult to treat by any means. The greatest chance of success, of course, is by the use of muscle education and relaxation exercises together with occupational therapy and proper psychological training. Occasionally it seems advisable to exercise certain of the nerves to the finger and wrist flexors, in the upper forearm, but, while this has been of benefit in a few cases, it cannot be recommended as a routine operation for it has been a disappointing procedure too many times.

Surgical fusion of the rigidly flexed wrist is probably the most valuable operation of all on the spastic upper extremity. This type of wrist has marked deformity which responds neither to physical therapy, manipulation, nor gradual correction by force. True, the correction can often be rather easily obtained, but it cannot be maintained. Fusion of the wrist in a slight cock-up position is the only procedure which can be relied upon to keep the hand in a functional position. This improved position must be protected until fusion is quite solid, however, or the deformity will recur as the result of the continuous pull of the spastic flexor muscles. Even when there is little hope of much improvement in the function of the hand, the cosmetic improvement may justify the operation.

A certain group of spastics show definite signs of deficient circulation in the involved extremity. This is shown by mottled, bluish skin which is cold and clammy to the touch. These extremities are usually shrunken in appearance and there is actual atrophy and muscle weakness. It is in this group that sympathetic surgery is useful. Division of the thoracic trunk below the second thoracic ganglion will result in increased circulation and warmth in the arm supplied by it, and as a result, the improvement in growth and function will sometimes be remarkable. Division of the sympathetic trunk in the lumbar region will give similar results in the corresponding lower extremity. For reasons difficult to understand, these operations are not always followed by the same degree of improvement, but it is rare for patients to get no benefit from the procedure. In spite of these occasional failures, sympathetic surgery, while not widely accepted, in properly selected cases has a definite place in the treatment of spastic paralysis.

Summary

The successful treatment of spastic paralysis requires the correction of psychological maladjustment, neuromuscular incoordination, and deranged mechanics. The last mentioned factor can often be improved by surgery. The correction of the first two factors must be considered the basic treatment.

Surgery should be done only on patients able to cooperate in other types of treatment.

Epileptics and others who have progressive lesions are not suitable cases for surgery until the progress of the condition is arrested.

No attempt is made to summarize the literature on the surgery of spastic paralysis. The procedures described have all been valuable in the experience of the writer and men with whom he has been associated. There is no claim of originality.

Equitation had its special advocate in Sydenham and even consumptives with "colliquative diarrhea" were advised to ride horseback! Cold water to produce a chill was recommended by Celsus. Hyperpyrexia by heavy bed clothes was employed by *Petron* and the great heat and intense thirst was then controlled by drinking cold water.—*Clio Medica XVI, "Tuberculosis" by Gerald B. Webb, M. D.*

The Use of Heat in Gynecology

C. O. Molander, M. D.

In describing the use of heat in gynecology the numerous new short wave machines must be given serious consideration because of their now universal use. These new machines have flooded the market and, until the Council on Physical Therapy of the American Medical Association began investigations, were running wild. The possibilities for their exploitation were great and this made it necessary that careful study and research be instituted to prove their efficiency.

The use of heat in gynecology can be divided into heat as used for the external genitalia, and heat as used for the internal genitalia, giving the indication, purpose, physiological effects, sources of heat, technic and dosage, depth of penetration and the contraindications for its use.

External Genitalia

Heat for the external genitalia finds its chief indications in postoperative conditions, infections, traumas and rectal disorders. Its purpose is to relieve pain, increase circulation, and to hasten absorption. The infra red lamp, incandescent bulb radiation, hot water bottles, douches, and the sitz bath are the sources of heat used. Here at Michael Reese Hospital we have used largely the long infra red radiation from infra red generators, and short waves from the incandescent bulb in postoperative cases, especially for the relief of pain.

Such lamps should be placed at a comfortable distance from the perineum, usually from two to three feet, depending upon the individual reaction of the patient. The time of application is from one-half to one hour and may be given from two to three times per day or even more, depending upon the comfort of the patient.

The dangers in the administration of these forms of heat should not be minimized. The patient must be watched constantly and told that if the lamp gets too hot the technician must be called immediately to raise the lamp to a comfortable distance, otherwise a serious burn may result. The presence of scar tissue, loss of sensation due to previous operative procedure, or other pathologic loss of sensation are dangers which should be constantly kept in mind. The warm sitz bath can be used for muscle spasm in traumatic conditions and rectal disorders.

Three important factors should be kept in mind when giving heat: first, the quality of heat (wave length); secondly, the quantity of heat (energy absorbed by human body); and thirdly, the individual reaction. Irradiation should be steady and the patient placed in a relaxed position. The quality of heat is in many respects very important. To illustrate, the long infra red rays penetrate 3 to 0.1 mm. in human tissues and the short infra red penetrates from 10 to 30 mm.[1] It, therefore, makes considerable difference which source of infra red radiation is used.

The quantity of heat applied is likewise important. Goldsmith and Light[2] found that for heat between 18°-39° C. (64.4°-102.2° F.) temperature, the number of capillaries is increased, the rate of flow through the capillaries is increased, tissue metabolism is accelerated and the rate of exchange between the blood and tissues is increased and reaches its optimum. The blood entering the vein contains 60-65% of its saturated value of oxygen. Above 39° C. (102.2° F.) the number of capillaries is greatly increased. The flow of blood is so rapid that the blood entering the veins simulates arterial blood and is about 91% of its saturated value of oxygen.

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Internal Genitalia

Heat in this location is indicated in such conditions as sub-acute and chronic infections either specific or nonspecific, amenorrhea, dysmenorrhea, and post-operative adhesions. Here it is used chiefly to relieve pain, increase circulation and hasten absorption. Claims have been made that pelvic masses will be diminished in size and this will aid in complete restoration. It can be used preoperatively also and it has been stated that by so doing it can lessen technical difficulties by removing large pelvic masses.

Sources of heat used for treatment of the internal genitalia are dry heat, (as used by means of the Elliott method), moist heat, (as used in the form of douches), the conventional medical diathermy, the short wave electric field, and the short wave by the electro-magnetic induction.

Elliott Technic

This form of treatment is in reality a dry form of douche, given by means of a rubber bag that distends the vagina when attached to the machine, delivering water at a temperature from 115°-135° F. The temperature is as a rule increased to 128° F. and maintained from forty-five to sixty minutes. By means of this machine rectal temperatures can be raised to 104°-106° F. In cases of gonorrheal infection, the number of treatments required before a negative smear is obtained vary from six to twenty, and from fifteen to twenty-six for the urethral. This treatment, while it may be good, requires much time for its application. When large numbers must be handled safely and quickly in as short a time as possible, this method is not suitable. Burns may result unless a technician is well trained in its technic. "Another very distinct objection to an electrode in the vagina is the anatomic configuration of the vaginal mucus membrane. In normal conditions this is in rugae or folds, whereas in inflammatory conditions these may be greatly increased so that the temperature produced from an electrode would be quite unevenly distributed and therefore less effective than some apparatus that would distend the vagina, thereby flattening out the vaginal folds and obtaining greater surface area and closer contact to the diseased adnexa."[3]

The object of this treatment in specific infection is to create a temperature which shall kill the organism.

Moist Heat

Hydrotherapeutic methods are used in gynecology in the form of vaginal douches, enemata, and sitz baths.

The vaginal douche is one of the most common of hydrotherapy methods, and yet one of the most abused and least understood methods. Dr. Wolf[4] makes the following statement regarding it: "It must always be taken lying down and never unless this position can be maintained for at least twenty to thirty or more minutes. It is useless to run in quickly several quarts of water or to force them in while in the sitting position. A long, warm douche, slowly flowing from a height not greater than 12 to 15 inches above the patient's pelvis will help materially to increase her comfort and allay her inflammation and pain. The temperature may be raised from 98° to 110° to 115° F., depending on the pathology, and may be given in amounts varying from 3 quarts to 5 gallons—daily, or twice or thrice weekly as indicated. Protect the vulva and perineum with valein and thick towels or use a special speculum.

"The douche is preferably taken at bedtime or when complete rest for the quite relaxed organs may be assured. If a strained position is assumed either on the douche pan or in the tub, little good will be done and much complaint of the fatigue, backache and general discomfort. A pile of newspapers, or a firm pillow covered with rubber or oilcloth, a pillow at the back, and the feet supported will obviate this. The bathroom should be warm and a covering should be arranged over the tub—a heavy quilt generally to prevent taking cold.

"The continuous douche is used for inflammation, especially chronic, pain, and hemorrhage. If medication is added it is usually an antiseptic as chlorazene, lysol, tincture of green soap, lactic acid, boracic acid, etc. Sodium bicarbonate is frequently used especially to dissolve mucus and allay pruritus, also to neutralize acidity temporarily in sterility. No strong medicaments as bichloride of mercury or carbolic, should be allowed for obvious reasons."

Dr. Wolf[4] also states: "The warm sitz bath is given at a temperature of 98° to 104° F., usually for ten to thirty minutes. It is excellent as a sedative, to relieve spasm and cramp, to allay inflammation, to favor absorption of exudates, to increase blood supply and relieve congestion. It is therefore indicated in amenorrhea, oligomenorrhea, dysmenorrhea, backache, leukorrhea, pelvic inflammations etc. . . . The temperature must be raised gradually and care must be taken to prevent chilling."

Diathermy

Dr. Kovacs[5] states that "diathermy is a most satisfactory agent for the conservative treatment of chronic pelvic infections due to the gonococcus. The technique consists in using preferably the abdomino-vaginal or else the abdomino-rectal or transpelvic method employing 1000 to 1500 milliamperes of current. Treatments should be continued from twenty-five to thirty minutes and repeated at from three to five day intervals. Cherry[6] reports that this treatment relieves pain, diminishes the pelvic masses and aids in complete restoration. Used as a pre-operative therapeutic measure, it will eliminate many of the technical difficulties in the removal of large pelvic masses, and thereby contributes to a smoother convalescence. Incidentally the percentage of post-operative wound infection is lessened. Similar favorable results have been reported by Sheffey and Schmidt.[7] They emphasized the fact that less technical difficulty was noted in the operative cases preceded by diathermy as evidenced by decreased density of adhesions and their more ready separation. They preferred the abomino-sacral method to the intrapelvic ones, because the applications are simpler and because of the belief that increased circulation is the principal factor in the benefit derived, and not the increased temperature in the tissues."

Our experience at Michael Reese has been similar to that of Dr. Kovacs. Our Doctors Lester Frankenthal, Jr., Alfred J. Kobak, and Leon Krohn have done considerable work along this line and have made a report of their findings.[8]

Short Wave Diathermy

A comparative study of short wave diathermy in pelvic heating was made by Dr. John S. Coulter and Stafford L. Osborne.[9] This article is of importance because it shows the relative importance of various machines used in this work from 9 meters to 24 meters. Another machine used was the electro magnetic generator which heats by electro magnetic induction and has a wave length of 25 meters. In the study 9 subjects were used and 29 observations made. They state "Each patient was given an arbitrary twenty minute treatment. Twenty minutes was chosen because this is the usual time devoted to the average treatment in clinical practice. We found that the maximum temperature is reached in less than twenty minutes. The maximum temperature attained is apparently that point where the rate of heat generation and the rate of dissipation by the circulating blood are equalized. During treatment each patient was covered with a light sheet. A specially constructed air bulb thermometer, which would not be affected by high frequency fields, was used for measuring temperature in the vaginal vault. The air bulb made of pyrex was embedded completely in the vaginal vault and its circumference was such that the vaginal canal was slightly dilated. The thermometer was calibrated against a Bureau of Standards thermometer. The instrument was calibrated before and after each experiment. Rectal and mouth temperatures were taken with a clinical thermometer.

"With short wave machines the so-called double pad or through and through technic was used, that is, the pelvis was between two suitably sized electrodes. This was the only available technic, inasmuch as no orificial electrodes were provided for use with these generators. The pads belonging to each machine were applied as instructed by its manufacturer. The pad electrodes were the usual rubber pads and varied from forty to sixty square inches in area. A towel in addition to a suitable thickness of felt was placed between the skin of the patient and the electrodes. The felt gave a suitable spacing and also assisted in the absorption of perspiration so that the surface heating was less uncomfortable to the patient. Much difficulty was experienced with surface heating except when the electromagnetic field was employed. The discomfort to the patient nearly always was so intense that the full output of the machine could not be maintained throughout the entire treatment without the danger of a burn. This accounts for the inability of short wave apparatus using condenser type electrodes to heat appreciably the deeper tissues. This seems to be a most undesirable and limiting factor of most short wave electric field generators. The electromagnetic generator does not use electrode pads but instead a heavily insulated flexible conducting cable. This method of tissue heating has been adequately described by Merriman, Holmquest and Osborne.[10] These authors[11] have also described the technic of application. The double pancake coil technic was used. The cable was wound in the shape of a double pancake coil each

consisting of three turns and wound in the same direction. One coil was placed beneath the patient under the buttocks with a towel and one layer of felt of one-fourth of an inch between the coil and the patient's skin. The other coil was placed over the lower quadrant of the abdomen so that the pelvic organs were between them. A layer of felt and towel was placed between coil and skin. Care was exercised that the cable connecting the two coils, and passing laterally over the trunk, did not contact any part of the body. This method of treatment was by far the most comfortable for the patient. Another great advantage is that if the intensity of the current has to be reduced, it can be accomplished without throwing the circuit out of resonance. Heating efficiency is therefore always at the peak."

"On a theoretic and experimental basis it is shown that the cavity electrode is far superior to other electrode arrangements for the production of high local temperature elevations in the pelvis. Air spacing is not necessary with such an electrode if appropriate minor changes are made in the connecting devices."[12]

There has been much confusion regarding the physical relationship and effects of these various short wave machines. Dr. Kovac has aptly described these physiological relations and effects relative to the advantages and disadvantages of the short wave machine. The following is an excerpt from Dr. Kovac's[13] article:

"The practical questions I am endeavoring to answer are: (1) the physical relation between conventional and short wave diathermy and the relative effects of the two methods; (2) the relative dangers of the two methods; and (3) the relative advantages, if any, of the new method over the older one.

"Short wave diathermy with its wave-lengths from 30 to 3 meters stands in close relation to the comparatively shorter wave lengths of infra red radiation on one side and to the longer, 300 meter waves on conventional diathermy on the other side. In penetrative power through tissues it exceeds both. Its primary physical effect is that of heat generation and this explains adequately its action. Specific electric vibratory effects for ultrashort waves are claimed by some authors, but they are hard to prove, just as it was not possible to prove conclusively any specific high frequency effects for conventional diathermy. As there is no essential difference between the primary physical effects of conventional and short wave diathermy, we cannot expect much difference in their physiologic and therapeutic effects. Heating by conventional diathermy occurs mainly through conductive resistance of the tissues, while in short wave there is both conductive resistance and hysteresis or dielectric heating. This may account for more uniform heating in depth and less heating in the skin, but the essential effect is still nothing but heating. Clinical experience and not experiments on inorganic media and on dead tissue will decide for which conditions the short wave form of heating is more preferable.

"It may also be stated at this time that claims for "selective" heating by short waves in laboratory experiments have not been corroborated in the living human organism and did not hold out hope for any practical therapeutic value.

"There appears to be a difference in clinical effects of short wave (from 12 to 30) and ultrashort wave diathermy (below 12 meters). The latter seems to exert a pain-relieving effect on acute inflammatory conditions, and it is claimed that it cuts short purulent skin infections and generally brings suppurative conditions to quicker resolution. While this action has been much emphasized as a specific effect, competent observers have failed to prove any other than heating effects by ultrashort waves. It is well known to all experienced physical therapists that other forms of mild heating, such as hot poultices and, in recent years, luminous heating, when applied efficiently produce similar resolving and sedative effects so far as purulent skin conditions are concerned.

"The earlier claim by some manufacturers that short wave diathermy is safe and cannot cause burns is preposterous. Burns have occurred under electrodes due to undue current concentration or to over-heating and conflagration of the rubber insulation or the electrode cables placed on metallic parts.

"In spite of these reports it seems reasonably certain that short wave diathermy is comparatively safer than conventional diathermy. The skin does not get as hot, and, the electrodes being insulated, there is no danger of an immediate burn when electrodes are lifted off. There is danger due to a condenser effect on excessive perspiration under the electrodes and, hence, it is imperative to place absorbent material over the skin; furthermore, no flexible metal electrode should ever be used without the interposition of a towel or felt pad. Animal experiments have shown that it is possible, by short waves, to cause coagulation in the depth without any burn on the surface, thus the possibility of deep destruction by excessive heating cannot be denied.

"The relative advantages of the two methods can be considered from the standpoint of (a) convenience, (b) efficiency, (c) ultimate results. In all these considerations it must be taken for granted that apparatus of equal relative efficiency is being employed.

"From the standpoint of convenience, short wave diathermy is undoubtedly superior to the older method because the application of condenser electrode is quicker and simpler; furthermore, treatment can be administered with due care over curved surfaces, over wounds and through plaster casts where it would be impossible to apply diathermy. The new method of heating an extremity or, part of it, efficiently, by winding about a coil or a cable activated from a short wave apparatus is also a marked convenience. For general body heating this coil has also proven quite useful.

"The fact that, with short wave diathermy, treatments can be administered on the fully or partly clothed body is an advantage in the hands of the beginner, however, it is likely to breed carelessness and neglect of the elementary rule of any electrical treatment, i. e., close inspection of the parts before and after treatment.

"From the standpoint of efficiency, conventional diathermy has the great advantage that it allows in local treatment a fair estimate of minimum and maximum dosage through the use of the milliameter and that the same dosage can be repeated at subsequent treatments. In short wave treatments the skin sensation of the patient is the only guide for the regulation of the current input, as the tuning device only shows that under the given technic a maximum resonance is present between the treatment and the oscillating circuits. There is no proof that maximum dosage is passing and there is no safeguard against burning of the skin or possible damage to the deeper parts in case of deficient skin sensation. This crude method of dosage regulation is the greatest present drawback of short wave therapy and until it is satisfactorily remedied, many local treatments will be administered on the principle of the hit or miss

method only. In short wave fever treatments the rise of temperature is a reliable guide.

"It is a fact that many patients like the smooth form of heating and all absence of faradic sensation by short wave treatment. On the other hand, I have heard many intelligent patients who have had diathermy treatments before, express doubt whether the "short waves" were as effective as their diathermy treatments. It is more than likely that many of the beneficial effects of diathermy originate from reflex action through the skin and the relative lack of skin stimulation undoubtedly plays a role in the different sensory effects of short wave treatments.

"For general treatments, notably artificial fever treatments, short wave diathermy from suitable apparatus is much superior to conventional diathermy because it allows easy handling of the patient, avoids constricting strappings and the danger of burns by plate contact.

"From the standpoint of ultimate results, at present there is no proof that short wave diathermy gives better results in the conditions in which diathermy is usually of value. An effort to tabulate similar conditions treated by diathermy and short wave diathermy in the physical therapy department of the New York Polyclinic Medical School and Hospital and compare the number of treatments needed for recovery in each, shows almost the same average number for each. In my office work for the average number of patients who get along well on short wave diathermy, there is a corresponding number getting on just as well and just as quickly on conventional diathermy.

"I believe that we have in short wave therapy, a new, flexible and fairly simple form of deep heat treatment which compares favorably with conventional diathermy. I do not think that it will essentially change the treatment of any condition in which diathermy has been applied heretofore. In due time we will undoubtedly learn under what conditions the new form of treatment is preferable to the older one, but not until the regulation of dosage has become more clear cut and we are able to determine definitely the amount of heat effect in the depth."

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While sun radiation was a time-honored treatment, little was published on insolation until our own time when *Rollier* in "La cure de soleil" (1915) brought the treatment for so-called surgical tuberculosis into prominence. *Morin* in 1912 had reported good results from such treatment in the tuberculosis of lymphatic glands, bones, joints and skin. Koch had noted that the tubercle bacillus was quickly killed by sunlight. *Finsen,* towards the end of the nineteenth century, conducted experiments with light therapy and found the ultraviolet rays caused sunburn. He introduced light therapy for lupus. Rollier believed that patients who developed the most pigmentation of the skin from heliotherapy recovered more satisfactorily from extrapulmonary forms of tuberculosis. Challenging the sun with artificial actinism naturally followed and it was found that quartz was transparent to the mercury arc ultraviolet radiations. Actinotherapy has been of great benefit in lupus vulgaris but while advantageous in bone and joint tuberculosis, it cannot displace orthopedic measures. Good results have also been obtained in certain cases of abdominal tuberculosis but few cases of pulmonary disease would seem to profit by light therapy, in fact many have been harmed by its use. By means of a mirror composed of an alloy of magnesium and aluminum *Verba* and *Foster* have been able to reflect the actinic rays of the sun for the treatment of tuberculous laryngitis. — *Clio Medica XVI, "Tuberculosis" by Gerald B. Webb, M. D.*

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The 1937 Convention Is in the Air

Plan now to attend the sixteenth annual convention, June 27, 28, 29, 30, July 1st. Headquarters, Hotel Lowry, Saint Paul, Minnesota. COME! COME! TO THE LAND OF THE SKY BLUE WATERS. The perfect vacation spot. Minnesota literally abounds in lakes and forests with every outdoor sport. You may choose a resort hotel that vies with any city accommodations, or seek the rustic lodges hidden deep in the pine and spruce of the Superior National Forest, or go on a canoeing trip with competent guides and portage from one beautiful lake to another. We guarantee a vacation spent in the forests of northern Minnesota will give new life and will leave you with joyous memories that are never to be forgotten. More about this vacation land when the winter snow begins to thaw.

The Minnesota Chapter, working with the National Program Chairman, Miss Dorothy Frederickson, is arranging an attractive and educational program of which you will read more elsewhere in this issue.

In the Twin Cities there are physical therapy departments to visit in hospitals and schools, of the latter the most interesting is the new department just completed at "Michael Dowling School for Crippled Children," with all modern equipment and a very fine treatment and swimming pool. Definite plans are being made to visit the latter and Shriners' Hospital for Crippled Children.

Clinics will be held at Universty Hospital, Minneapolis, and the Gillette State Hospital in Saint Paul. Dr. Krusen, Chief of Physical Therapy, Mayo Clinic, is planning a full day's program, including luncheon, on Thursday, July 1st, at Rochester, Minnesota.

Minnesota is half way between East and West, so plan early to make it a 100% attendance. A warm welcome is awaiting you.

Minnesota Chapter.

TENTATIVE PROGRAM FOR 1937 CONVENTION

Sunday, June 27th

2:00 P. M. Registration
6:00 P. M. PEP SUPPER

Monday, June 28th

9:00 A. M. Address of Welcome
9:30 A. M. Business Meeting
11:00 A. M. Paper on SCOLIOSIS
2:00 P. M. Clinic at Gillette State Hospital
7:00 P. M. Mental Hygiene
8:00 P. M. Personality
9:00 P. M. Speech Defects

Tuesday, June 29th

9:00 A. M. Clinic at University Hospital
12:00 Noon Luncheon
2:00 P. M. Visit to Shriners' Hospital and Dowling School
4:00 P. M. Tea and Exhibits
7:00 P. M. Banquet

Wednesday, June 30th

9:00 A. M. Business Meeting
2:00 P. M. The Rationale of Physical Therapy in the Treatment of Muscle Disorders
3:00 P. M. Clinic on Massage
7:00 P. M. Nerve Injuries
8:00 P. M. Electrotherapy — Demonstrations

Thursday, July 1st

9:00 A. M. Full day at Mayo Clinic, Rochester, Minnesota

Attention

Members-at-Large and Chapter Members:

Who cares about a convention without an exhibit? None of us!

The exhibits are the nucleus of the convention and here friends gather to discuss practical and pertinent points of physical therapy. Individuals, chapters, or institutions having material should send in their application at the earliest possible date to Miss Georgia M. Schori, Local Publicity Chairman, Shriner's Hospital, Minneapolis, Minnesota.

Helen S. Foss, Chairman,
Committee on Publicity.

Notices

The Vocational Bureau, which was formerly maintained by the Association, is now carried on a smaller scale by the National Secretary. Any members who wish to be placed on the list for a position should get in touch with the Secretary, Miss Edith Monro, 483 Beacon Street, Boston, Massachusetts. All members who have been placed on this list should be sure to notify the Secretary as soon as a position is secured.

The Illinois Association for the Crippled was organized on March 28, 1936, and held its first annual conference in Chicago on January 18, 1937. The present officers, with Paul H. Fesler as president, were re-elected for the ensuing year. The following problems were brought up for consideration: (1) prevention of diseases which might lead to crippling; (2) finding of crippled children; (3) hospitalization and treatment of these individuals; (4) their education; and (5) vocational training, guidance and placement of the handicapped.

The Sixteenth Annual Convention of the International Society for Crippled Children will be held at the Schroder Hotel in Milwaukee, Wisconsin, May 9 to 13, 1937. An interesting program on physical therapy, with Miss Lucy Blair presiding, is being planned by the Wisconsin Chapter for the noon and afternoon sessions on Wednesday, May 12.

Dr. William Bierman, Chairman of the American Registry of Physical Therapy Technicians, has requested that a representative of the American Physiotherapy Association be selected to serve on the Advisory Board of this registry. Miss Janet B. Merrill, of the Children's Hospital, Boston, has consented to accept this appointment.

The Second Annual Meeting of the Ohio Chapter will be held on April 13 and 14, 1937, at the Deshler-Wallick Hotel in Columbus in conjunction with the Ohio Hospital Association. The program follows:

Tuesday, April 13th

9:00 A. M. Registration.
9:30 A. M. Clinic—Children's Hospital
Dr. Edward Harlan Wilson
Demonstrations by Mrs. Hardin, Miss Snaveley and Miss McManus
11:30 A. M. Inspection of exhibits—Deshler Wallick Hotel
1:30 P. M. Business Meeting—Election of officers
3:30 P. M. "Should Hospitals be Exempt Under Social Security Act?" H. H. Graef, Children's Hospital, Akron, Ohio
4:15 P. M. "Cooperation Between Hospitals and Industrial Commission." Sidney McCurdy, M.D., Director, Ohio State Industrial Commission
Continue business meeting

Wednesday, April 14th

9:30 A. M. Opening meeting—Miss Emmy Kylin, President, presiding.
9:45 A. M. Round table—Ohio Hospital Association
"Set-up and Cost of a Physio Department in a Hospital." Miss Helen Kaiser, Mt. Sinai Hospital, Cleveland, Ohio
Discussion—Margaret W. Cleavland, Cleveland, Ohio
10:30 A. M. "Birth Hemorrhage to Produce a Spastic Child." Dr. H. E. LeFever, Columbus, Ohio
11:15 A. M. "The Interrelationship of Orthopaedics and Physiotherapy." Dr. John A. Judy, Dayton, Ohio
12:30 P. M. Luncheon—Presiding—Mary Brogrett Deatherage, Children's Hospital, Akron, Ohio
2:00 P. M. Afternoon Session, Presiding—Mrs. Anna M. Elliott, City Hospital, Akron, Ohio
"The Bio Chemistry and Physiology of Muscular Fatigue." Dr. D. Roy McCullough, Cleveland Clinic, Cleveland, Ohio
3:00 P. M. "Visual Education in Posture Work"
Esther Gilman, Assistant Prof. Physical Education Dept., Ohio State University
3:30 P. M. Address—Dr. J. H. J. Upham — President-elect of the American Medical Association
4:00 P. M. General business meeting
7:00 P. M. Banquet—All Associations

Many members of the Chicago Chapter have attended the evening course in electrotherapy which has been given at Northwestern University Medical School during the fall and and winter quarters.

The Michigan Chapter called a meeting on November 13, 1936, to hear the reports of delegates who attended the National Convention, and the conventions at Boston and at Cleveland. On January 20, 1937, the chapter was invited to attend the staff meeting at North End Clinic in Detroit. The subject of the evening's discussion was electrotherapy. On February 19, 1937, a bridge party was given to raise money to help defray the expenses of delegates to the National Convention. Bridge was followed by an enjoyable program and refreshments.

The Committee on Education of the American Physiotherapy Association has been notified by the Council on Medical Education and Hospitals of the American Medical Association that the course in physical therapy offered by the Hospital for the Ruptured and Crippled, New York City, has been added to the list of schools previously approved by the Council.

There is perhaps no evidence that tuberculosis existed in Egypt in predynastic times. No tuberculous bones of this period have been found and the non-existence of tubercle would seem to be indicated by the fact that 90 percent of the bodies examined have been adults. . . . However, Professor Schrumpf-Pierron of Cairo has recently published a reproduction of a statuette from the collection of Docteur Innes, appearing to date from *ca.* 4000 B.C. . . . The statuette represents the most ancient portrayal of disease so far discovered and was found in a vase. . . . It is suggested that the subject is portrayed taking a sand bath in the sun, a custom which still prevails in nearby Nubia. The figure would seem to have been copied from a man with chronic phthisis complicated by Pott's disease. The placing of the statuette in a vase, with head and shoulders exposed, seems to indicate that the treatment would be continued in the world beyond.—*Clio Medica XVI, "Tuberculosis" by Gerald B. Webb, M. D.*

It is curious, also, that the Indians on both continents were familiar with the picture of Pott's disease. This picture is so characteristic that orthopedic surgeons assert that tuberculosis alone can be the cause. It is almost inconceivable that the American Indians could imagine such a picture. In pre-Columbian bronzes from Peru, in effigy water bottles from the Indian burial grounds of many of our states, and from the pictographs of the cliff-dwellers, all pre-Columbian, the unmistakable picture of Pott's disease is portrayed. It is of especial interest that in the pictographs the artists have indicated paralysis of the legs. The individuals are usually lying on their backs, and playing the flute, a suggestion of occupational therapy! . . . The Indians* appear to have been familiar with the kyphosis of the aged as well as with the kyphosis of spinal caries.—*Clio Medica XVI, "Tuberculosis" by Gerald B. Webb, M. D.*

*The Navajos have a hunchback deity... the "hunch" is thought to be the equivalent of a cornucopia.

ABSTRACTS

John S. Coulter, M. D.

The Postural Syndrome Related to Obesity Leading to Postural Emphysema and Cardio-respiratory Failure

By William J. Kerr, M.D., F.A.C.P., and John B. Lagen, M.D., San Francisco, California, in Ann. Int. Med., 10:5:569, November 1936.

It is our purpose to discuss one of the most important syndromes seen in the practice of adult medicine and to suggest measures for symptomatic relief based on knowledge of bodily mechanics and function. We refer especially to a type of obesity which appears to be exogenous in origin, arising in persons whose dietary habits lead to a caloric intake beyond their daily requirements. It is not easy to determine whether individuals with the relaxed habitus are predisposed to the train of events which follows, but it is apparent that when medical attention is sought these patients present the posture of relaxation. The gradual accumulation of adipose tissue in the normal depots for fat gives the appearance of rotundity, and the state is usually designated as corpulency. The accumulation of fat in the third decade is relatively symptomless. Friends will comment on the gain in weight, and subjects will note the expanding girth with the attendant strain on buttons and realize that they must discard belts for suspenders. At this stage some dyspnea will be noted on exertion, and a few suffer from symptoms referable to strain of the spinal column.

It is during the fifth and sixth decades that patients in this group are obliged to seek medical advice from the internist. The clinical syndrome is, as a rule, remarkably complete. The presenting symptoms are usually increasing orthostatic dyspnea, cough, cyanosis and edema, referable to the respiratory and circulatory systems. Along with these, or as chief symptoms, are radiculitis associated with "irritation" of nerve-roots: a group of less well defined symptoms originating in the vertebral bodies, intervertebral discs and ligaments; symptoms resulting from muscular strain and weakness, including pains in the orbits associated with strain on the extra-ocular muscles and such obvious defects as ventral and inguinal herniae; symptoms of strain on the lumbosacral and iliosacral articulations; and symptoms of strain on the hip- and knee-joints and the arches of the feet.

The appearance of the patient when fully undressed, and when viewed at a distance from the side, is one of extreme relaxation. The most striking feature is the rounded protuberant abdomen; but upon further inspection it is apparent that the entire outline of the silhouette is altered. The curves of the spine are all accentuated; there is a moderate or marked lordosis of the lumbar spine, the sacrum is more horizontal than normal, and the thoracic spinal curve is increased with the shoulders forward and the arms suspended in front of their normal position; the upper ventral thoracic region is depressed; the head and neck are well forward with the chin out, accentuating the increasing kyphos in the upper thoracic spine; the eyes are elevated to retain vision in a horizontal direction; the pelvis is rotated backward; and the legs are flexed at the knees. The stature is shortened more or less, and sometimes patients state that they have lost two or more inches in height from their measurements earlier in life. They have the appearance of stooping to avoid an overhead obstruction. Several have remarked that their friends ask why they always stand as if they were entering a low tunnel. They have the appearance in outline of women in the later months of pregnancy, which may be duplicated in the normal individual by holding in the hands or by suspending in front of the abdomen a heavy weight. If such faults in the distribution of weight were not corrected by re-alignment through the shifting of other masses of the body, the individual would be unable to maintain the erect posture.

The vital capacity of the lungs early in the evolution of the syndrome is normal, but as the thorax changes shape after many years of faulty posture there is gradual reduction in vital capacity. This is due in part to the great mass of fat in the upper abdomen and in part to the loss of elasticity in emphysematous areas of the lung. At first the contrast to obstructive emphysema is great but in the terminal stage of postural-emphysema the vital capacity may be markedly reduced also. Of greater importance is the tidal air of ordinary respiration. Although we have not been able to verify our impression that the tidal air is greatly reduced, because of the difficulties in getting patients to breathe without conscious effort under experimental conditions, there can be little doubt of such reduction under given circumstances. One of the striking symptoms described by such patients is dyspnea in the upright position, which we have designated as orthostatic dyspnea. Almost invariably, except in the terminal stages when secondary cardiorespiratory complications have arisen, such patients will be able to lie in the prone position without respiratory embarrassment. The reasons for this are obvious when the foregoing comments are recalled; the thorax is extended; the diaphragmatic attachments are now in a more fixed position; and the abdominal counterweight which must be lifted at great expenditure of energy in the upright position now becomes a minor encumbrance during expiration. The counterweight, through gravity, may now actually assist in the ascent of the diaphragm in expiration, and the elasticity of the lungs becomes a more effective agency in the exchange of gases. These considerations must be kept in mind in treatment and will be reviewed later on in consideration of the management of the patient.

Prophylactic treatment would, of course, be most rational. Unfortunately, those who have a tendency to exogenous obesity (those who could personally do something about it) disregard the laws of the conservation of energy through ignorance or neglect. Sedentary habits and overindulgence of food are sure guides to obesity for a great majority of people approaching middle life.

The automobile and other means for conserving energy are making the individual more toad-like. Attention to the diet and exercise will benefit the great majority of those who are approaching middle age. The cultivation of the postural reflexes will also be helpful for those with relaxed habitus.

The point of attack is in three directions, but with the same end in view:

1. Temporary elastic support of the pendulous abdomen.
2. Reduction in weight.
3. Postural exercises.

It occurred to one of us that if the patient could be given an abdominal support to overcome some of the weight applied to the diaphragm during inspiration and to relieve the counterweight during expiration, the tidal air would be greatly increased; the spinal curves would be straightened; and the line of gravity moved backward. If a belt were devised which gave abdominal support and if elastic materials were inserted in the belt at the sides of the abdomen, the tidal air could be further enhanced. These elastic materials would in effect serve as a method of giving the patient artificial respiration by assisting in the expulsion of gases from the lungs.

The plan for reduction in weight must be individualized for each patient, depending upon occupation, opportunity for exercise and general physical condition. A caloric intake should be determined which may be as low as 800 to 1,000 calories for some patients. At first two or three pounds per week may be lost and later not more than one or two pounds per week until the patient approaches the ideal weight after a period of six months. In some of these patients the problem of dietary intake is a difficult one, as all who have treated obesity can testify. For the great majority, however, the severity of their previous disability, and the remarkable relief derived by the use of the belt give them confidence in measures directed toward the source of their trouble. A silhouette of themselves from the side before treatment will often be a great stimulus for cooperation. The lessening of the girth due to loss of fat and improved posture will also lend encouragement.

Chief among the postural exercises are those which educate the patient to stand properly until the postural reflexes assume command. This requires attention toward the correction of the position of relaxation. Patients should periodically stand with their backs to the wall touching the wall at as many points as possible. When some of the excess weight has been removed, the abdominal muscles may be strengthened by graduated exercises. The familiar admonition to "suck up the guts" employed by instructors in physical education may be very easy to accomplish by boys in their early years but is almost impossible for the obese.

Summary

The postural syndrome which begins with obesity in the relaxed type of individual and passes through a series of events with increasing protuberance of the abdomen and deformity of the spine is discussed. The results of continued strain on the spinal axis and irritation of the spinal nerves are manifested by diverse clinical symptoms and signs which frequently bring the patient to specialists in many branches of medicine. The later complications in the abdominal wall, such as herniae, may be classed as "blow-outs" resulting from weakness of the retaining structure. The respiratory and circulatory manifestations are primarily due to interference with proper ventilation of the lungs based upon postural defects and the disadvantages under which the diaphragm functions under the circumstances. The orthostatic dyspnea, reduced vital capacity and tidal air, polycythemia and cyanosis are closely related. In older subjects hypertension, systemic and pulmonary, and arterio-sclerosis account for definite cardiac complications. Treatment requires temporary support for the pendulous abdomen and assistance in the evacuation of the lungs during expiration. A belt which gives this support and aids in expiration through the elastic force of materials inserted in the sides of the belt is described. This we have found of great benefit in the early months of treatment. The weight should be gradually reduced to correct the distortion of the spinal axis and restore the spinal curvature. Postural training is of greater value after the adipose tissue has been reduced but is of little value in the patient with a pendulous abdomen and a great counterweight of visceral fat which interferes with the ascent of the diaphragm during expiration.

The Measurement of Muscle Tonus

By J. D. Olav Kerr, M.B., Ch.B., Assistant to the Regius Professor of Physiology, University of Glasgow; and Laurance D. W. Scott, M.B., Ch.B., F.R.F.P.S.G., Hall Tutorial Fellow in Medicine, University of Glasgow; Dispensary Physician to the Western Infirmary of Glasgow; in British M. J., No. 3954, p. 758, Oct. 17, 1936.

Muscle tonus influences many of the bodily functions, and attention recently has been directed to the importance of hypotonia as a cause of post-operative atelectasis and circulatory failure. Accordingly, a method for the measurement of muscle tonus is greatly needed, and much work has been done with this object in view. The elastometers of Wertheim Salomonson, Noyons, Mangold, and Gildemeister are ingenious pieces of scientific apparatus, but are open to so much criticism that they have never come into general use. Gildemeister's method of measuring tonus by means of a hammer and ballistic galvanometer has been used clinically by Springer, Hosiosky, and others, but the readings obtained in this way vary considerably with the amount of subcutaneous fat present in the part under observation. The use of such apparatus shows the resistance of the tissues to a deforming force and cannot be claimed to give an accurate estimate of muscle tonus. The elaborate apparatus of Fenn and Garvey is of value for research rather than for clinical purposes. In fact, the only practical method available at the bedside has been until recently the estimation of the degree of passive movement obtainable at the joints. By this means gross hypotonia could be appreciated but could not be recorded graphically.

It is scarcely necessary to emphasize the fact that there is always a certain tonic longitudinal pull exerted by the bundles of fibres in a muscle, even when at rest. The internal pressure is therefore dependent upon the tonicity of the fibres, and varies throughout the body according to the state of contraction or relaxation present. However, by ensuring that the muscle examined is relaxed, these variations can be avoided and an estimate obtained of the degree of tonus present in that particular muscle. This enables the variations in tonus produced by different general conditions to be studied.

Poliomyelitis—A Resume

By Wilburt C. Davidson, M.D., Durham, N. C., in Am. J. Dis. Children, 52:5:1158, November 1936.

Etiology

The proof is conclusive that the infectious agent of poliomyelitis is a virus. The physical properties of this virus have been thoroughly studied. Its presence can be determined by inoculation of monkeys, and antibodies to it can be titrated by neutralization tests. A toxic factor has been found in the stools and urine of patients with poliomyelitis and inoculated monkeys, which can be neutralized by horse serum. A double etiology of a virus and organisms in the stools has been suggested, but, like the occasionally resurrected theory that the streptococcus is the cause of poliomyelitis, that theory is sinking into oblivion.

Pathologic Process

In the acute state the reticulo-endothelial system is always involved, the thymus is congested, and there is acute follicular necrosis of the germinal centers of the spleen and of the intestinal lymphoid structures but only to a slight extent of the lymph nodes of the periphery, mediastinum and mesentery. The tonsils usually are hyperplastic. Petechial hemorrhages are found in the fundus of the stomach. The distinctive degenerative lesion of the disease is found most commonly in the ganglion cells of the lower motor neurons in the lumbar and cervical enlargements of the spinal cord. The axons show demyelinization; if the axis-cylinders are destroyed, the paralysis is permanent. There may be extensive necrosis of the substance of the cord with loss of minerals in the nerve cells, and capillary hemorrhages and interstitial cellular infiltration occur about the vessels.

General Care.—Absolute rest in bed in the position the patient would be if standing erect, or in that of greatest comfort, good nursing and quiet surroundings are essential during the acute stage. A fracture board may be necessary to prevent sagging of the mattress. Pain should be relieved by sedatives, hot applications or immersion of the affected limb in a tepid bath. The patient should be moved and disturbed as little as possible. Orthopedic treatment, the details of which are described elsewhere, is desirable from the onset. If the slightest weakness develops in any muscles, in order to protect them and to prevent stretching, contracture and deformity, the affected limb should immediately be placed at complete relaxation and rest in an overcorrected or neutral position and should be held by splints, braces or preferably by comfortable light weight plaster casts; the opposing muscle group, especially, must be watched for weakness. The part should be kept warm by hot water bottles and bed clothing supported by a cradle. If there is a choice, the muscles which are most important for an erect position should be protected, e.g., the hip extensors, the knee extensors, the abdominal and spinal muscles and, unless unimpaired as compared with the ankle dorsiflexors, the calf muscles; also the abductors of the humerus, the wrist flexors and the muscles which bring the thumb out from the palm to face the other fingers. No massage or manipulation should be allowed during the sensitive stage. Even if the bladder is completely paralyzed, catheterization should not be done; the bladder will eventually empty itself reflexly.

Treatment With Serum.—The serum of convalescent patients and of 80 percent of adults neutralize the poliomyelitis virus, but when either of the serums is administered intraspinally it probably does more harm than good. Many still believe that serum has value when given intravenously or intramuscularly as soon as the first symptoms occur and before the onset of paralysis, especially in large amounts from 100 to 300 cc. and by transfusion. However, the evidence gained by treating alternate patients and by the observation of controls seems to show conclusively that no benefit is produced. In a small series of cases in which two or more large intravenous transfusions were given, no improvement could be demonstrated. No deaths occurred, but several of the patients had severe reactions. Deaths have followed the injection of human serum. An excellent study of the pros and cons of this question has recently been published.

Respirators occasionally save lives, but selection of the type of patient who will be benefited by a respirator requires considerable experience and judgment. In New York in 1931 nearly five times as many patients treated in a respirator died as compared with those not so treated. The harm produced by alveolar emphysema, which has been observed at some autopsies, may outweigh the benefit.

Treatment of the Bulbar Type of Polioencephalitis.—The foot of the bed should be elevated, for postural drainage; mucus and other secretions should be aspirated by suction from the throat and larynx; sufficient sedatives should be given to keep the patient quiet (although the risk of pneumonia should be remembered); liquid food should be administered in small amounts (by nasal tube if swallowing is impossible); fluids should be given parenterally or through the rectum; oxygen and carbon dioxide may be necessary for cyanosis, and, last but not least, a respirator should not be used, as it probably does more harm than good in cases of the bulbar type. Drugs (ephedrine, atropine, etc.) and lumbar puncture are not recommended. A tracheotomy may be necessary.

After-care of Persons with Paralysis.—Advances in this field, started by Taylor in 1867, have equaled, if not surpassed, the progress in etiologic studies. The hopeless cripple of the last generation is rarely seen today. A complete examination of the muscles should be made as soon as the sensitiveness is over. When recuperation is well established, carefully supervised gentle exercise, particularly voluntary movements within the capacity of the muscle, is of value. Warm salt baths, very gentle massage (after all tenderness has disappeared), fresh air, sunlight and warmth are beneficial. Training of the muscles should be done only by someone who has a thorough knowledge of functional anatomy; it should be preceded by baking and massage to increase the circulation in the part and should be increased gradually. Fatigue must be avoided.

The transition to weight bearing should not be allowed as long as recovery is expected; then it should be gradual, and overexertion and fatigue should be avoided. When the patient with weakened legs or trunk is standing, splints should be applied to hold the feet and knees in their normal position, and a corset or jacket should be used to hold the trunk in the normal position, to prevent deformity. These should be inspected frequently and changed as necessary. Swimming does not take the place of localized training of muscles and may cause harmful contractions in the muscles which oppose the weaker, paralyzed ones. Treatment in water has no more specific value than treatment on a table, but it is a pleasant way of doing exercises. The buoyancy of the water allows weak muscles to perform their

function more easily than is possible otherwise. Injection of a solution of ephedrine and lumbar ganglionectomy have been used to increase the supply of blood to the paralyzed part to prevent wasting. Surgical procedures, such as the transposition of tendons, should be deferred until at least two years after the acute stage. Mechanical braces and instruction in their use have enabled many severely paralyzed patients who otherwise would be bedridden to maintain an active life.

Physical Agents in Treatment of Circulatory Diseases of Extremities

By Nelson W. Barker, M.D., Division of Medicine, The Mayo Clinic, Rochester, Minn., in Arch. P. T. XVII:9:554, September 1936.

Heat Applied to Different Parts of the Body.—Gibbon and Landis have advocated immersing the forearm in hot water (113 degrees F.) or wrapping both arms in an electric pad covered by towels to produce vasodilatation in occlusive arterial disease of the legs and feet. They have demonstrated that vasodilatation of the toes occurs with such treatment, as is evidenced by rise of the skin temperature in the toes. This is apparently attributable to efforts of the body as a whole to eliminate the extra heat, and the vasodilatation stops when application of the heat is discontinued. Such treatment should not be used in cases of thrombo-angiitis in which the arteries of the arm have been occluded.

Hot Soaks.—In the treatment of gangrene and ulcers attributable to ischemia, hot soaks have been employed extensively. All these lesions are infected and at their margins there are extensive leukocytic infiltrations and often collections of serum and pus which increase pain and delay healing. Drainage is often inhibited by thick sloughs and crusts. Soaking the extremity in warm solutions produces some vasodilatation and helps to loosen the crusts and to promote drainage. The temperature of the solution should never exceed 105 degrees F. Strong antiseptic substances should not be mixed with the solutions. Boric acid is commonly used since it will not dissolve in greater concentration than 8 percent at the temperature named. Four or five soakings, for fifteen to thirty minutes each, may be used in a day, depending upon the patient's tolerance and the condition of the lesion.

Hot Packs.—In general, hot, wet packs should not be used on ischemic limbs, but they are of definite value in the treatment of acute thrombophlebitis of all types when combined with elevation of the extremity. It is advisable to grease the skin with petrolatum and to cover it with a thin layer of gauze.

Diathermy.—As a vasodilating agent, diathermy has had limited use. It has not been found to be superior to simple external application of heat and its effects do not persist after it is discontinued. There is probably some danger of burns if the plates are applied to ischemic tissue. There is no rational basis for the local use of diathermy through regions containing sympathetic ganglia.

Postural Exercises.—These were advocated by Buerger and are often called the Buerger exercises. They have been used chiefly in the early or chronic cases of occlusive arterial disease when trophic lesions are not present. The method is to have the patient supine on a bed or cot and to instruct him to elevate his legs to a vertical position with thighs flexed and legs extended; he holds this position for one minute. He then swings his feet over the side of the bed and assumes a sitting position with the feet dependent; this position he also holds for one minute. He then lies supine with legs horizontal for one minute. The cycle is repeated five times for a total of fifteen minutes. A better technic is to individualize the timing by maintaining elevation of the feet until the more ischemic foot becomes blanched and to maintain the dependent position until the color has returned and the superficial veins have become distended. In some clinics vigorous inversion and eversion of the feet, when they are dependent, are also advocated. The rationale of this treatment is to aid the development and enlargement of the collateral arterial channels. Clinical experience seems to endorse its value, but there is little objective confirmation.

Exercises with the Extremity Elevated.—These may be used in the treatment of chronic venous insufficiency of the limb following thrombophlebitis of large veins, but should not be attempted until at least four weeks after the thrombosis has occurred. To exercise the legs the patient lies supine, with legs elevated, and carries out bicycle riding movements for periods of one minute, alternating with periods of rest with the legs horizontal for one minute. To exercise the arm the best method is pulling a weight or some overhead resistance from the position of complete abduction of the arm, with elbow extended, down until the shoulder is abducted to an angle of 90 degrees and the elbow flexed to 90 degrees. It is known that muscular movements are one of the principal factors in promoting venous blood flow and that muscular movements, with the limb elevated, tend to aid in the development of the venous collateral circulation without subjecting the veins to undue strain and excessive pressure.

Intermittent Pressure and Suction—(Passive Vascular Exercise.)—Although the basic idea of this method of treatment has been known for many years, Landis and Gibbon, and Reid and Herrmann, deserve credit for having perfected the apparatus. At present it is difficult or impossible to predict results in a given case. An impartial evaluation of the intermittent pressure and suction treatment is that it has a certain place in the armamentarium but that it is by no means superior to other and certain simpler methods of therapy of vascular diseases and that it cannot be used routinely in all cases.

The Sanders Bed—The most recent mechanical device used in the treatment of peripheral vascular disease is the Sanders oscillating bed. This bed is similar to a child's seesaw, or teeter board, the fulcrum of which is midway between the two ends. When one end rises the other sinks. Before treatment is begun, the bed is fixed in what is called a middle position. This position may be set af various angles from the horizontal. In use, the ends of the bed travel through a total fixed arc of 70 degrees, half of which is described above and half below the position the ends occupied when they were in the middle position. The foot and head of the bed can be raised on the base if desired and there is an additional hinged joint at the level of the knees so that the patient can be placed in various postures. The speed of the cycle can be adjusted at two, four or eight minutes. For cases of peripheral vascular disease the treatment merely amounts to postural exercises carried on for long periods of time without effort on the part of the patient, and the physiologic effect is the alternate partial draining and filling of the arterial tree by gravity. It is necessary to adjust the speed and angle of rotation to the individual patient so that the period of blanching is as short as possible.

Exercise in Diabetes Mellitus

By Alexander Marble, M. D., and Rachel M. Smith, A. B., Boston, in Arch. Int. Med., 58:4:577 October, 1936.

Exercise along with diet and insulin is an accepted part of the present day treatment of diabetes. Its ability to increase the blood sugar-lowering effect of insulin is well recognized. Under certain conditions, however, exercise may cause a marked increase in the sugar content of the blood of a diabetic subject. This occurs particularly if the diabetic condition is severe and if several hours have elapsed since insulin and food were given. Such a finding is in keeping with the clinical observation of the preinsulin days that, whereas patients with mild diabetes profited by exercise, those with severe diabetes were often unable to tolerate it.

Comment

The foregoing results demonstrate that in the fasting patient with severe or moderately severe diabetes who has received no injection of insulin for several hours, the immediate result of exercise may be that of raising the blood sugar level. This contrasts with the effect seen in the normal nondiabetic subject, in whom moderate exercise of short duration causes little if any change in the blood sugar content. It is true that in normal persons more strenuous exercise, although it is of short duration, may cause a significant transient rise in the blood sugar content but this is not nearly as marked or as constant as in the diabetic subject. Moreover, when the exercise is strenuous and prolonged, a decided decrease producing hypoglycemia may result.

Exercise apparently stimulates the breakdown of glycogen in the liver, with a resulting outpouring of sugar into the blood stream. It is probable that this glycogenolysis is attributable in part to an increased secretion of epinephrine caused by the exercise.

In the normal subject this flow of sugar from the liver is probably not as great as it is in the diabetic patient, since the stores of glycogen in the liver of the diabetic patient are comparatively less stable; furthermore, hyperglycemia is less severe because the sugar released is quickly used by the muscles. In the completely diabetic organism, however, as has been shown by Yater and his co-workers, contracting muscle is unable to utilize the dextrose molecule to obtain extra energy (although the dextrose requirement of the resting skeletal muscle is the same in the diabetic as in the nondiabetic state). These investigators regard it as a function of insulin to elaborate dextrose utilization by the muscle. It seems reasonable to suppose that in the diabetic patient the unutilized sugar accumulates in the blood stream, producing hyperglycemia noted in the studies reported in this paper.

Richardson found that although the diabetic subject with a normal blood sugar value during fasting responded to exercise in an essentially normal fashion, the patient with slightly more severe diabetes (with a fasting blood sugar value of approximately 175 mg. per hundred cubic centimeters) showed after exercise an even greater drop than a normal subject. He explained such results on the assumption that although the patient is able to withdraw sugar from the blood in a fashion approaching the normal, the glycogen stores of the body are not adequate to afford protection from hypoglycemia. In our subjects no response of this type was observed. Even in case 3, in which the blood sugar value during fasting varied from 120 to 188 mg. per hundred cubic centimeters, definite increases in the blood sugar content were obtained after moderate exercise.

It is evident that such studies bear a direct relationship to the treatment of diabetic patients. In the first place, they point out definitely the value of adequate control of the diabetic condition. The diabetic patient of today leads an essentially normal life, with an average mount of activity. If the diabetic condition is imperfectly controlled and if the body has been supplied with an inadequate amount of insulin, then exercise instead of conferring benefit may actually increase the hyperglycemia and glycosuria.

Our results suggest another point with regard to treatment. For exercise to exert its maximum benefit, sufficient insulin must be available in the body at the time of exercise. Practically speaking, after he arises in the morning the logical sequence for the diabetic patient is insulin, exercise and breakfast rather than exercise, insulin and breakfast. The exercise should be mild enough so that undue fatigue is not produced. The further advantage of two, three or more additional periods of exercise during the day is obvious.

In their studies on the effect of muscular exercise in two carefully controlled cases of uncomplicated diabetes, Soskin, Strouse and their colleagues were unable to show "significant improvement in the diabetic tolerance or a decrease in the insulin requirements." Their results, although obtained for only two patients, were definite and unmistakable. One must agree then that exercise does not cause any fundamental change in the severity of the diabetic condition. (The improvement in physical fitness and muscular development produced by exercise will be conceded by all.) One knows, however, that by taking advantage of temporary decreases in the blood sugar content caused by insulin plus exercise, one may materially increase the amount of food given without any increase in the dosage of insulin. This was not brought out in the studies of Soskin and his associates, because their patients were kept on a constant diet and dosage of insulin. If, however, one gives additional food at those times of the day—commonly in the late forenoon, in the late afternoon and at bedtime—when by the combined effect of insulin and exercise the blood sugar value is lowest, one can easily demonstrate that on days of muscular activity much more food can be tolerated with the same or even a smaller quantity of insulin than on days of relative inactivity. Priscilla White has brought out this point strikingly in her studies of diabetic children at summer camps. One is impressed by the fact that under carefully controlled conditions, which include the accurate weighing of food, the frequent estimation of the blood sugar value and the daily determination of the quantity of sugar excreted in the urine, these young patients with severe diabetes tolerate more food and are in better health than during the winter, when for a large part of the day they are at school and inactive. To be sure, the exercise makes the diabetic condition no milder, and there is no significant lasting gain in tolerance which can be attributed to the exercise per se, but the end-result for the period of activity is the same; namely, the actual utilization of more food with the same or a lessened need for insulin.

Summary

Exercise of short duration carried to the point of only mild fatigue invariably caused a definite and often a marked increase in the concentration of sugar in the blood of young patients with severe or moderately severe diabetes who had not received food or insulin for several hours.

A Simple Inexpensive Heat Lamp

By Frank H. Krusen, M. D., Rochester, Minn., in Jour. A.M.A., 107:10:780, Sept. 5, 1936.

Nearly every physician uses some form of heat lamp as a routine in his office practice. Many practitioners are unfamiliar with the fact that various sources of infra-red or heat rays differ in their ability to produce heat penetration. While none of the heat lamps used in medical practice produce very marked penetration of heat, those which contain an "infra-red unit" (heated coil or heated carborundum plate) produce the least penetration. These so-called infra-red units differ not at all in their output of therapeutic heat from the heat elements used in household heaters, which can be obtained for a few cents at any hardware store or even at the five and ten cent store. The only difference between the household heater and the infra-red lamp used in the physician's office is that the former has a wider pan or reflector, which is shaped like a soup plate and which diffuses the heat through the room, while the latter has a cup-shaped reflector which concentrates the heat at a distance of approximately 2 feet (60 cm.) from the lamp. The infra-red units produce a more marked surface heat sensation than do the luminous bulbs, which are also used in the cup-shaped reflectors seen in physicians' offices.

The various parts for an entire unit of this sort, a reflector, a clamp (which can be attached to the bed or back of a chair), a connecting cord, a luminous heat bulb and an infra-red heat element can be purchased almost anywhere in the country for approximately $4.00.

A Study of "Simple Disuse Atrophy" in the Monkey

By Herman Chor and Ralph E. Dolkart (from the Department of Nervous and Mental Diseases and the Department of Chemistry, Northwestern University Medical School); in Am. J. Physiol., 117:4:626, Dec. 1, 1936.

Conclusion

Disuse atrophy is a distinct entity and is simple in character, as revealed by histologic findings.

Disuse atrophy consists primarily of a uniform reduction of the bulk of each muscle cell, especially of the sarcoplasm. It is not attended by any evidence of degeneration or attempts at regeneration. Irritability to electrical stimuli remains unaffected.

There is no alteration in the proportions of water and nitrogen content.

Simple disuse is not associated with any demonstrable changes in the anterior horn cells of origin of the respective nerve supply and the atrophy of the peripheral musculature due to disuse does not result in such changes.

Book Reviews

SLIM AND SUPPLE: A NEW SYSTEM OF SWEDISH EXERCISES FOR YOUNG AND OLD. By Barbro-Leffler-Egnell. Translated from the Swedish by Greta Olsson, M. R. C. S., L. R. C. P. Cloth. Price, $2.00. Pp. 209 with 274 illustrations. New York & London: D. Appleton-Century Company, Inc.

This book gives in detail, with excellent illustrations, ten lessons in exercises for women of all ages who are free from organic troubles. The author is a Swedish authority on gymnastics. The lessons are graded from the simple exercises to the more involved. It is intended for the lay person who wishes to take daily exercises, and for this purpose it can be recommended.

A PREFACE TO NERVOUS DISEASE. By Stanley Cobb, A. B., M. D., Bullard Professor of Neuropathology, Harvard Medical School. Cloth. Price, $2.50. Pp. 173 with 13 illustrations. Baltimore: William Wood & Company, 1936.

This is another of the recent "handbooks" on neurology in which an attempt is made to simplify the study of the central and the peripheral nervous systems. Written by one of the leading teachers on this subject, the material is presented from the standpoint of the medical student primarily, but to be sure will be found extremely instructive to all who may deal, directly or indirectly, with clinical problems involving the nervous system.

The subject of neuro-psychiatry is presenting itself more and more in the foreground in medicine and therefore a knowledge of the essentials of this difficult but all important subject should be extremely profitable. The cerebro-spinal and the autonomic nervous systems are briefly dealt with first from the anatomical standpoint. This is soon followed by a consideration of motor integration and locomotion in which muscle activity in man is presented as the highest level within which simpler and lower segmental motor mechanisms of the lower forms find representation. In view of the recent newer ideas regarding the "upper motor neuron concept" in the spastic type of paralysis, the author's clear explanation simplifies very much a difficult and controversial subject.

There is an excellent chapter on cerebral circulation which is especially timely. Epilepsy and mental disorders are discussed briefly but present the problems as they exist at the present time. A considerable portion of this small volume is devoted to histologic pathology of the nervous system, a subject in which the author is well informed and has done considerable excellent research. This book is heartily recommended as a preface to a study of neurology and psychiatry.

LIVE LONG AND BE HAPPY: HOW TO PROLONG YOUR LIFE AND ENJOY IT. By Lewellys F. Barker, M. D., Visiting Physician, Johns Hopkins Hospital, Baltimore. Cloth. Price, $2.00. Pp. 224. New York & London: D. Appleton-Century Company, Inc., 1936.

This small volume is essentially a "pocket edition" system of medicine for the intelligent layman who wishes to know something about his body and the maintenance of health and happiness. The author, who is recognized as one of the leading medical authorities of the present day, states that "most people wish to live as long as possible," and consequently are entitled to a better knowledge of those factors which influence the duration and enjoyment of life. The relations of heredity and environment, of personal habits and occupations, and of diseases and various organs and parts of the body to the longevity of life and the pursuit of happiness are dealt with in simple straightforward language.

In addition to the better knowledge of one's physical makeup and those factors which influence health, a

regular periodic health examination by the physician is stressed as an important aid in increasing the longevity of the individual.

A HEALTH EDUCATION WORKBOOK FOR TEACHERS, PARENTS, NURSES AND SOCIAL WORKERS. By Kathleen Wilkinson Wootten, M. A., Professor of Health, Head, Department of Health and Physical Education, Georgia State College for Women, Milledgeville, Georgia, Author of "A Health Education Procedure," "Health Education Activities," "A Health Workbook for College Freshmen." Paper. Price, $1.50. *Pp.* 292. *New York: A. S. Barnes & Co., Inc.*

This is a workbook giving an activity program planned especially for the practical training of teachers already in service and for those in training. The author believes that all instruction in health, from nursery school through post-graduate medical school, should be planned definitely to encourage better personal living. The material in this health workbook is divided into the four necessary and overlapping phases of the health education program; namely, qualifications and training of the teacher of health, healthful school living, health service, and direct health education or health instruction. This volume can be recommended to those interested in this subject.

PRINCIPLES OF CHEMISTRY. By Joseph P. Roe, Ph. D., Professor of Biochemistry, School of Medicine, George Washington University, formerly Instructor in Chemistry, Central School of Nursing, Washington, D. C. Fourth Edition. Cloth. Price, $2.75. *Pp.* 475. *St. Louis: C. V. Mosby Company,* 1936.

This is a textbook of inorganic, organic, and physiological chemistry written to meet the needs for instruction in these subjects in schools of nursing where only forty-five to sixty hours is devoted to these subjects. That it has filled a definite place is indicated by the necessity of four editions since 1927.

The language is as simple and popular as is consistent with scientific writing. The material presented is adapted to the needs of the student nurse. Special emphasis is placed upon the physiological and clinical phases of chemistry.

In the latter part of the book there is a comprehensive set of laboratory experiments designed to supplement the theoretical work presented and to give the student training in laboratory technic.

THE NATURE AND TREATMENT OF ASTHMA, HAY FEVER AND MIGRAINE. By Alexr. Gunn Auld, M. D., Diplomate in Public Health (Oxford); Physician to Westminister General Dispensary; Senior Physician to St. Marylebone General Dispensary; Chief Tuberculosis Officer, Borough of Fulham; Assistant Physician, Royal Infirmary of Glasgow, and the Prince of Wales' General Hospital, London; Curator of the Pathological Museum and Lecturer on Clinical Medicine and Pathology in the North-east London Postgraduate College. Cloth. Price, 12 *s.* 6 *d. Pp.* 257. *London: H. K. Lewis & Co., Ltd.,* 1936.

This volume contains a selection of the clinical investigations of the author on asthma, hay fever and migraine. All the chapters except one have been previously published either in the Lancet or the British Medical Journal. There is a short section on the use of general ultraviolet radiation in asthma which in the opinion of the author was, on the whole, favorable.

THE PATIENT AND THE WEATHER. By William F. Petersen, M. D., with the assistance of Margaret E. Milliken. Volume II—Autonomic Dysintegration. Cloth. Price, $6.50. *Pp.* 530 *with* 249 *text figures. Ann Arbor, Michigan: Edwards Brothers, Inc.,* 1934.

This is the second volume of this excellent series on the patient and the weather. (Volume I, Parts 1 and 2 have been reviewed in previous issues.) In this volume the author has brought together observations made on the individual who is unusually responsive to the environment, in whom clinical reflections become apparent because the chemical and endocrine tides that are set up are unusual in amplitude or because tissue foci exist which cannot adequately accommodate to even the normal swings of the metabolic rhythm. These persons are designated as nervous or as neurasthenic.

The author believes that particularly in America is the clinical study of these autonomic instabilities of growing importance. In this volume the following subjects are considered: the organism as a cosmic regulator; vascularization, the focal reaction and biological rhythm; penetration of bacteria and the localization of disease; focal infection; headache; epilepsy; eclampsia and premature delivery; mucous colitis and gastric ulcer; the neuroses; urticaria; asthma, arthritis; glaucoma; the ear; the teeth; and alopecia areata.

In the last chapter the therapeutic implications are considered. The author states that physical therapists would improve the autonomic disturbance by altering the splancho-peripheral balance. Although they do not use this term, it is the ultimate objective. The skin is stimulated by massage, heat and ultraviolent radiation. This volume can be recommended to physical therapists.

A TEXT-BOOK OF PHYSIOLOGY. By H. E. Roaf, M. D., D. Sc., M. R. C. S., Professor of Physiology in the University of Liverpool. Second Edition. Cloth. Price, $6.75. *Pp.* 679 *with* 338 *illustrations. Baltimore: William Wood & Company,* 1936.

This substantial work is intended to serve as a textbook of physiology for students of science and of medicine. It contains a great wealth of information, and the 338 figures are extremely instructive.

In spite of being a second edition, however, it shows an extraordinary lack of polish in its punctuation. The definition of "horopter" on p. 649 is superfluous and mathematically incongruous, and raises doubts as to the accuracy and importance of other material. The book would be improved by the omission of sentences such as those on p. 589 ("A cold climate is one with a low temperature.") and 590 ("Clothing for hot climates should contain as large air vents as possible."). Neither the index nor the table of contents helps one to find such subjects as the classification of white corpuscles or the physiology of cerebrospinal fluid.

The text is divided into four parts: (1) mechanical aspects, (2) chemical aspects, (3) regulating mechanisms, and (4) maintenance of the individual and reproduction of the species. This is a welcome deviation from the traditional arrangement of physiological material. The book is not sufficiently critical to be recommended generally to medical students, and much too inclusive to appeal to nurses. It is more likely to appeal to those who wish to supplement a physiological library with a volume which departs somewhat from the conventional and includes occasional details not found elsewhere.

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